PROCEEDINGS

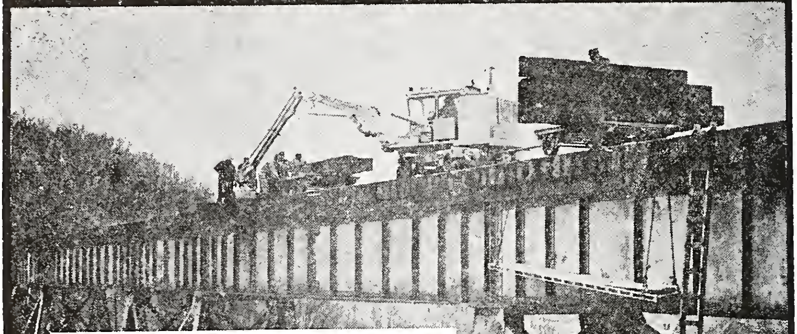
Eighty-First Annual Convention

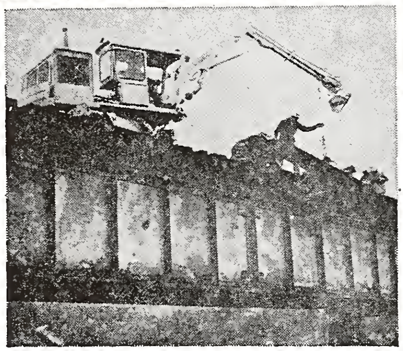
OF THE

American Railway
Bridge & Building Association

1976

the NEW KERSHAW BRIDGE CRANE





Pictured above — New ties are on the push car behind the crane. Old ties are placed on the push car in front. The Bridge Crane removes old ties and installs new ones by clamping the ends of the ties.

Pictured at left — Replacing raising timber.

The Bridge Crane is designed to enable bridge forces to replace ties, caps, stringers and raising timber on open deck trestles rapidly and ecnonomically.

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Proceedings of the

Eighty-First Annual Convention

of the

American Railway
Bridge & Building
Association

Held at

CHICAGO, ILLINOIS

September 13-15, 1976

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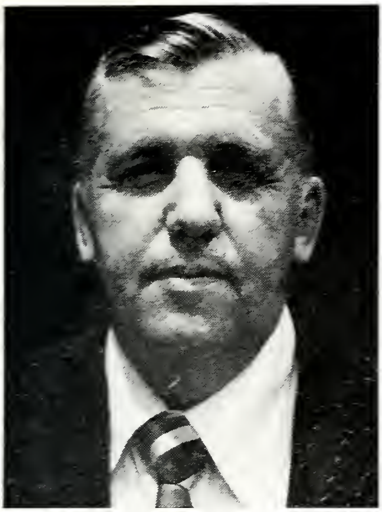

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REGISTRATION totaled 717 railroaders and 118 ladies

PROCEEDINGS

September 13, 1976

A Joint Meeting of the Roadmasters' and Maintenance of Way Association of America and the American Railway Bridge & Building Association was called to order at the Hyatt Regency-Chicago, Chicago, Illinois, Monday, September 13, 1976, at 9:35 A.M., Mr. J. B. Williams, President of the Bridge and Building Association, presiding.

President Williams: Will you come in and please be seated.

As President of the American Railway Bridge and Building Association and on behalf of Mr. Dennis, President of the Roadmasters' & Maintenance of Way Association of America, I declare this, the 81st Annual Convention of the American Railway Bridge And Building Association and the 88th Annual Convention of the Roadmasters and Maintenance of Way Association of America to be open in Joint Session.

It is proper that we pause and ask for divine guidance and inspiration prior to commencing our meeting. I would like to introduce the Rev. Le Roy Cronkhite II, pastor, Central Church of Chicago, who will deliver the Invocation. Rev. Cronkhite.

(Rev. Cronkhite gave the invocation)

President Williams: Thank you, Rev. Cronkhite. Please feel free to leave whenever you wish. Of course, should you care to remain for all or any part of our program, you are certainly welcome to do so.

I join with President Dennis in welcoming you to this first Joint Session of our two Associations. We sincerely hope you will enjoy your visit to Chicago and our programs will prove beneficial to you.

We have a very interesting program for the ladies. Registration is in the Water Tower Room, where they will be served coffee and rolls each morning. An interesting trip is planned for tomorrow.

I will now turn the meeting over to Mr. Dennis, President of the Roadmasters and Maintenance of Way Association, Mr. Dennis.

President Dennis: Good morning, gentlemen. On behalf of the Roadmasters and Maintenance of Way Association, as President of this Association, I will join President Williams in welcoming the members of both Associations to this 88th Annual Convention of the Roadmasters and Maintenance of Way and the 81st Annual Convention of the American Railway Bridge & Building Association.

We urge you to attend all sessions of this Convention. The committees of these two Associations have worked hard in preparing these two programs and we are confident they will be of real benefit to you and your railroads. We guarantee if you communicate, make friends, and discuss mutual railroad problems, you will find this is the best place in the world to get information concerning track maintenance.

This afternoon the Roadmasters will convene in this room and the B & B will be convened in Room D. The meetings will be in separate sessions.

At this time, I would like to introduce the Officers and Directors of the Roadmasters' Association who are seated at the head table. As I introduce each person, I ask that he stand and remain standing until all have been introduced. We also ask that you withhold your applause until all have been introduced.

Beginning at my extreme left:

A. S. Barr, Director, chief regional engineer, Penn - Central, Pittsburgh, Pennsylvania. Mr. Barr is also Chairman of Registration and Vice Chairman of two other committees.

R. E. Frame, Director. He's also director of rehabilitation and capital planning, operations planning and control, ConRail systems Corporation, Philadelphia, Pennsylvania.

F. H. McGuigan, Director. He's construction engineer, Missouri Pacific, St. Louis, Missouri. And he is Chairman of our Advertising Committee.

M. S. McClendon, Director, general roadmaster, systems, Frisco Railroad, Vinita, Oklahoma. He serves on the Advertising and Training Committees, as Vice Chairman.

W. W. Hay, Director. Professor of railway civil engineering, University of Illinois, Urbana, Illinois. And Dr. Hay is Chairman of Special Subjects and Vice Chairman of the Training Committee.

A. C. Parker, Director, chief engineer, maintenance of way, Louisville, Kentucky, L. & N. And he's Chairman of the Program Committee and Training Committee and Vice Chairman of Special Subjects.

D. J. Gale, Director, engineer of track, Union Pacific, Salt Lake City, Utah. Vice Chairman of the Membership Committee and Vice Chairman of one other committee.

B. D. Sorrels, Director, division engineer, Santa Fe, Amarillo, Texas. And he's Chairman of the Resolutions Committee and Vice Chairman of the Convention Program.

H. D. Hahn, Treasurer. Director, public works, engineering, Chicago & North Western, Chicago, and Chairman of the Finance Committee.

R. K. Pullem, division engineer, Chessie System, Akron, Ohio. He's our 2nd Vice President.

W. J. Cruse, 1st Vice President, chief engineer, Rock Island, Chicago. Mr. Cruse is Chairman of the Ladies' Activities Committee.

Our next two gentlemen, we will introduce later.

I am R. E. Dennis, regional supervisor, maintenance of way, CN Systems, Winnipeg, Canada.

You may now applaud. (Applause)

I now turn the podium over to President Williams.

President Williams: I would like to introduce to you some of the Officers and Directors of the Bridge and Building Association. Gentlemen, as your name is called, will you stand and remain standing.

Director—F. B. Lindsay, Jr., general bridge supervisor, Southern Railway, Greensboro, North Carolina.

Director—O. C. Denz, supervisor building maintenance, Chicago, Milwaukee, St. Paul & Pacific, Chicago, Illinois.

Director—R. C. McMaster, engineer of facilities & structures, Bessemer & Lake Erie, Greenville, Pennsylvania.

Director—W. E. Brakensiek, assistant chief engineer, Missouri Pacific, St. Louis, Missouri.

3rd Vice President—J. R. Iwinski, assistant chief engineer, structures, Chicago & North Western, Chicago, Illinois.

2nd Vice President—J. C. Hobbs, chief engineer, Richmond, Fredericksburg & Potomac, Richmond, Virginia.

1st Vice President—W. H. Rankin, senior structural engineer, St. Louis-San Francisco Railroad, Springfield, Missouri.

You may now applaud. (Applause)

You will meet the other gentlemen seated at the rostrum as the program continues. Mr. Dennis.

President Dennis: It is now my honor to introduce a Canadian of whom we are very proud. He is a man who has gained prominence in the railroad industry and is well known to many of you. This gentleman will be on our program again tomorrow afternoon, so I have to save something nice to say about him at that time.

Gentlemen, may I introduce Mr. John Fox, chief engineer-system, CP Rail, Montreal, Canada, and President of the American Railway Engineering Association. Mr. Fox, please. (Applause)

Greetings from AREA

Mr. Fox: President Dennis, President Williams, guests, members of the Roadmasters and Maintenance of Way Association of America, the American Railway Bridge & Building Association, gentlemen:

It is a pleasure to be here today and I must thank both your Presidents for extending to me an invitation to attend this convention. It is also nice to see so many of my friends in attendance who over the years have assisted me in so many ways.

This Convention, or Technical Conference, as we in the AREA prefer to call them, in addition to providing a forum for the discussion of technical problems relating to the railroad industry, also provides a meeting place for railroaders where mutual problems can be discussed and often your own difficulties are solved by discussions with other railroaders. We should never be afraid to find out, if one has a problem and this means asking a number of questions, I know the majority of railroaders present here will be only too happy to answer any questions related to their railroad experience. If, however, you are impertinent enough to ask other questions of a more personal nature, you will, I know, also receive answers but they may not be to your liking.

The railroad industry is, I believe, ending an era which will present each of us with a new and different challenge and everyone connected with the industry will have an opportunity to show what each can contribute to our own railroad and well being and continued greatness in both the United States of America and Canada.

I would like to extend to each of you an invitation to attend the next AREA regional meeting which will be held in Pittsburgh on October 21, and also the Annual Technical Conference to be held in Chicago March 29 and March 31 at the Palmer House. The 1977 Conference will be held in conjunction with the REMSA Exhibit at the McCormick Place, March 28 to March 31. On behalf of all the members, Directors and Officers of the American Railway Engineering Association, I extend to the Roadmasters and Maintenance of Way Association and the American Bridge and Building Association the wish that you have a most successful Convention. Thank you. (Applause)

President Dennis: Thank you, Mr. Fox, for those greetings from the AREA.

It is now my pleasure to introduce Mr. Earl Hodgkins, executive director of the AREA. Mr. Hodgkins, will you please stand and be recognized. (Applause)

I will now turn this rostrum back to Mr. Williams.

President Williams: There is another organization that works very closely with the B & B and the Roadmasters in making this Convention a success. This is the Railway Engineering-Maintenance and Supply Association, more commonly known to us as REMSA. Now I would like to introduce L. E. Martin of Templeton Kenley & Company, Broadview, Illinois, and president of REMSA. Mr. Martin. (Applause)

Greetings from REMSA

Mr. Martin: President Dennis, President Williams, special guests, ladies and gentlemen:

It is indeed an honor for me as President of REMSA to be asked to take part in welcoming you to your Annual Convention. I speak for all the members of REMSA in wishing you a very successful and productive 1976 meeting.

For years, our Association has worked in close cooperation with both your Associations and I feel that this has been a very profitable and contributory alliance.

Each year we recognize the contributions that the Presidents of your two associations have made and I have the pleasure of presenting a gold pin in recognition of these contributions. At this time, I would like to ask Rod Dennis to step forward.

Congratulations, Rod, on your contributions. I would like to present on behalf of the membership this pin, which reads: "President–Roadmaster and Maintenance of Way Association of America—1976." Thank you.

President Dennis: Thank you, Lou. I'm very proud to accept this fine emblem of office and it will bring me many happy memories of the great association in years to come. Thank you. (Applause)

Mr. Martin: Jack, could I ask you to step over a minute.

Congratulations on your contribution. We present this gold pin, which reads: "President, American Railway Bridge & Building Association—1975-1976."

President Williams: Thank you much, Mr. Martin. I appreciate it. (Applause)

Mr. Martin. Jack thought he was through and I thought he was going to make a speech.

I did want to let you know that from the returns we are getting for space applications at the Exhibit to be held this year for the first time, that is, the 1977 Exhibit to be held in the Spring of next year for the first time in McCormick Place, it is going way beyond our expectations. There is no question that this is going to be the biggest exhibit we have ever had.

Now, while you are here, we hope that you will enjoy yourselves. All the officers and directors of REMSA, Larry and Eilleen McGuan, are at your call. Anything we can do to make your stay more enjoyable and problem-free, please call on us.

We hope many of you are looking forward to the Annual Banquet Tuesday Evening in the Regency Ballroom. Complimentary tickets are available for all registered railway personnel and their wives. You will hear more about the entertainment and the banquet shortly. Thank you very much. (Applause)

President Williams: Thank you, Mr. Martin.

Now, I would like to introduce Mr. J. H. Hines of Pandrol, Ltd., and Vice President of REMSA, who has a few words to say to us. Mr. Hines. (Applause)

Mr. Hines: Thank you, John. On behalf of REMSA, it's my pleasure to inform you of the lighter side of our Association.

President Dennis, President Williams, guests, ladies and gentlemen:

A "Circus Theme" will be the setting for REMSA's Annual Banquet in the Regency Ballroom on Tuesday evening, September 14th. The doors will open at 6:30 P.M.

The Clown Band will greet you at the door, and this will be followed by dinner and a fast pace program of entertainment. We sincerely hope this will permit all of you to spend some time Tuesday evening visiting with your friends and suppliers.

Headlining the program is Kenny Milton as Master of Ceremonies. Milton is a nationally famous comedian who has appeared in Las Vegas, New York, Miami, in the movies and on TV.

Cathy Johnson and Bob Bonie will feature sophisticated musical selections and unusual guitar solos. Cathy, you will recall, electrified the 1973 Banquet when she was called on to substitute for a performer who was injured in an auto accident.

You will marvel at a most unique and exciting dancing act by The Keys. I am sure you will enjoy the program we have prepared for you, especially the music by an old friend of the railroads, Benny Sharp and his orchestra. The Clown Band will alternate with the orchestra during dinner.

The same ticket arrangement will prevail, as it has for many years that REMSA has had the privilege of hosting the Joint Roadmasters and Bridge & Building Convention. REMSA is honored to host all registered railroad men and their wives. We certainly hope all of you will be with us for REMSA's Circus Night. Thank you very much. (Applause)

President Williams: It is now my pleasure to introduce our keynote speaker. This is really just an exercise on my part since he is already known to most of you.

He holds a Bachelor of Science Degree in Business Administration from Syracuse University and a Master's Degree in Transportation Economics from Columbia Graduate School.

His railroad experience dates back to his student years when he held a summer job as a brakeman on the Long Island Railroad.

He has served as Director of Profit Analysis for the New York Central System, Director of Cost and Price Analysis for the Southern Railway, Vice President for Marketing at the Illinois Central, and Administrator of the Federal Railroad Administration.

For the past 22 months he has been making headlines as the President and Chief Executive Officer of the Rock Island.

An engaging speaker, he has some interesting things to tell us about the Rock. Mr. John W. Ingram. (Applause)

What's Happening on the Rock Island?

By JOHN W. INGRAM

President & Chief Executive Officer, CRI&P

John W. Ingram

I'm delighted to be here. In a way, a number of us at the Rock have been looking forward to today. It was back in February that Jack Williams invited me to be a speaker here. I sort of thought September was a long way off, but said I'd come as long as we were still in business and had a positive cash flow. Jack expressed great confidence that the Rock would, indeed, still be around, and went so far as to say that the bridges would probably hold up the rest of the railroad.

I'm glad to report that we're still here—that the cash flow is, indeed, positive (in fact we have had a couple of months of real honest-to-goodness profit, and the accounting people have had to order some black ink for a change)—and that over the past eight months, we've only had one serious problem with a bridge. And that wasn't Jack's fault—it was some guy driving a locomotive who happened to head for an Iowa corn field while half his train was still back there coming across the river.

I might note that repairs were made very quickly and very well in that one incident—and I have a sneaking suspicion that the bridge gang had been told that a train with my business car was about ten hours away and getting closer every minute! That was indeed the case, and I had a special reason for wanting to keep that train moving. We had plans to host a fairly fancy dinner on that car for the town fathers in Herington, Kansas, and we didn't want to take them to the local bar and grill instead.

Town to build M/W facility

But we did get to Herington, we did have a most cordial dinner, and by the time we were lighting cigars, those folks had agreed to issue tax-exempt industrial revenue bonds to finance the construction of a major facility for the care and feeding of our maintenance-of-way equipment.

As far as we can tell, this is the first time industrial revenue bonding has been used for a railroad facility; usually, they just build factories or warehouses. But Herington's people agreed with us that a maintenance-of-way equipment shop is, indeed, a factory, full of machines and employees, with raw materials coming in one end and finished products going out the other, and we have a very nice arrangement. Jack probably didn't realize this until now, but fixing that bridge with great speed was the best thing that could have happened to the Rock's roadmasters this year—because we're well on our way to changing rusty and yellow junk into active and blue machinery, and we're getting our tools back out on the railroad once again, where they belong.

And that sort of gets me into my topic here this morning. No one gave me a specific assignment as to the subject of my remarks, and when that happens, I simply take up my own favorite topic, which is "What's Happening on the Rock?" It's the same speech I give when some of the cynics in the world ask me "What the hell is a lousy railroad like yours doing still in business anyway?"

First of all, we're not a lousy railroad —and we never were. Run-down, yes. Something of a geographic puzzlement? Possibly. An institutional barrier to an irrational combining of western railroads? Definitely. But an anachronims in America's rail transportation system? Never.

Has good grade and alignment

One of the main reasons we feel there's an essential place for Rock Island routes on a national rail map is a reason understood positively and well by roadmasters, bridge and building people, engineers in general, and the purchasing department in particular. Grades and curves. It helps an awful lot to be a flat and relatively straight railroad, especially in the face of an energy situation that is going to get worse before it gets better. We move more tonnage with less fuel.

It also helps an awful lot to go to the major cities we get into—and connect with the railroads we connect with. It helps an awful lot to be a north-south railroad through America's breadbasket, where we follow the combines north from Texas right on up to Minnesota during the various harvests and, as a result, manage to keep our equipment busier longer. It helps to be the one railroad in Iowa—where farmers are very busy growing grains for export—that provides single-line service to the Texas Gulf.

It helps an awful lot to have a bunch of employees on the railroad right now who take a certain amount of twisted pride in referring to themselves as "survivors." It's no secret that sheer necessity has caused us to have fewer people doing more things, and generally they have found that they can get their jobs done efficiently and well and still get eight hours 'sleep at night. We take great pride that on the Rock these days we're a pretty tough bunch of railroaders.

At the same time, we also know—all of us—that a great many other changes will have to occur before we can sit back and take a breather. We are running a railroad today that sat for close to a dozen years in a sort of limbo—waiting for a merger that was supposedly right around the corner every month, but those months dragged into years. In each of those years, we did a little less maintenance than we should have. After all, it was going to become the responsibility of someone else very soon—why waste the money?

Property was neglected

I don't have to recount to this group what happens when you cheat a little bit every year on work that really ought to be done. You wake up one morning and find that your deferrals have been cumulative; that tie-life has suddenly run out on not just a few ties per rail-length, but on most of them. You wake up and find—after doing a little bit of investigation — that yesterday's derailment was caused by a broken rail that a Sperry car had identified two years before. You wake up and find that you not only have car shortages in various places at various times, but that you also have congested yards—not because business is good, but because bad-order cars are taking up all the space.

You wake up and find that your ballast has turned to cement because it was cheaper — half-a-dozen years ago — to pick up some poor limestone instead of shipping in some granite or slag.

You wake up to a lot of things—and the first decision you have to make is that you simply cannot roll over and go back to sleep.

And that's the position the Rock is in today. We have determined not to go back to sleep; we're on our feet getting the circulation going; we've been given a helpful respite from the cold thanks to Section 77 of the Bankruptcy Act; we have prevailed upon that great benefactor in the sky—the Federal government—to co-sign a modest borrowing so we can get started on the restoration of normal maintenance on our route from Chicago to Ft. Worth.

We're still awfully tight with every penny, every man-hour. We still do such things as dig our heels in with Chicago's Regional Transportation Authority—trying to remind them that the Illinois Legislature mandated them to pick up **all** the financial responsibility for rail commuter service, not 92% or 97% or 99%.

We do such things as require that new automobiles for the company fleet are a lot smaller than the cars we've bought in the past. Xerox machines no longer repose in almost every office—we're more efficient with a couple of centrally located big machines. We've received permission from our Court to move out of that 13-story fortress on Van Buren Street called the La Salle Street Station—and at our new quarters over here on Michigan Avenue, we will have almost all of our people on about one-and-a-quarter floors. We can watch each other a lot better that way.

We run our trains a little smarter—having cut switch-engine hours by 19% and train miles by 28%, while carloadings dropped 20%. (That drop in carloadings, b ythe way, isn't solely a reflection of the national economy. A lot of stuff that we used to carry at a loss now moves somewhere else, and we don't miss it at all.)

I mentioned earlier that we were forced to cut back the personnel ranks. We dropped almost one-third of our entire management cadre—and I don't think it handicapped our managerial ability one bit. We just manage a little more and a little better than we used to.

I could go on for another ten minutes reciting a litany of changes that have occurred on the Rock. But that wouldn't really give you the bottom line. You still wouldn't know what we're really up to.

The bottom line is this: We're fixing the railroad.

We're not patching it. We're sustaining it. We're not content to hang by our fingernails. We are fixing it.

It will take time—and a lot of money; we can't and aren't fixing it all at once. I wish we could, but we can't. We are going first to those areas that will have the greatest return, the quickest visible and practical benefit. We have $17.5 million in borrowed money that Uncle Sam has co-signed for; we are doing thorough work **in selected locations** along the so-called "spine" of the railroad from Chicago to Texas. That's where we have the heaviest density of traffic.

Rehabilitating Iowa lines

We are rebuilding our Iowa branch lines under the state's forward-looking Rail Assistance Program. Most of you are probably aware of the program there—wherein the state and shippers work with the railroad to finance needed improvements so those grain-gathering branch lines can carry 100-ton jumbo hoppers at good speed. The state and shippers advance the money, and we pay them back on a per-car basis. It's an interest-free loan, really.

At the same time, we are under way with a fairly ambitious program of our own down in Arkansas and Oklahoma. No Federal money, no shipper money, no state money—just the cash we have been able to earn and set aside thanks to the cost-cutting measures of the past 18 months. We are investing a million-and-a-half dollars a month down there—with a double-shifted fully mechanized system gang doing a complete tie, surfacing and rehabilitation job. They're fixing every grade crossing, every turnout; they're painting every bridge and building they come to (unless it's a building that serves no purpose—then they knock it down). They are sort of dry-cleaning and pressing that railroad in one fell swoop—and they've got 60 miles under their belts already. Now that we are getting delivery on our new machinery, I've been promised 50 miles per month.

Let me say just a word about system gangs. I know that in the maintenance-of-way business there has always been some controversy between the system gang concept and the section gang tradition. Without locking my words in concrete, I suggest that the system gang approach is the only economically effective approach when you have as much rilroad to fix as we do.

The concept requires that some maintenance-of-way managers change their entire outlook on life—but, as I said, "change" is the number one word in our lexicon these days. Ten days ago I dropped in on this gang down in Arkansas, and one of the things that caught my attention was the considerable amount of housekeeping work that remained to be done. The track work was fine; the trains that came through did not sway from side to side, and I didn't see any of those typical Rock Island puffs of dry dust squirting out around ties that were under joints. (And believe me, when I say "typical," I mean it. We have been down in the mud and dust for some time now.)

The gangs had done good work—they just hadn't cleaned up. When I mentioned this to the project manager, he said, "Don't worry . . . we'll come back and get all that stuff at the end of the job." He simply didn't understand that with asystem gang—on a 75-hundred-mile railroad—there is no "end of the job." When they finish that stretch of track between Little Rock and El Reno, Oklahoma, we've got another stretch of track for them to tackle. And when they've dry-cleaned and pressed that, they will be sent off to another route—and so forth and so on. A system gang never finishes its work, because once they've done the whole system, it's time to go back again and start at the beginning.

Retains section forces

We have section men, yes. But they won't be the ones who build railroad track. They'll be the ones who change out broken rail, tighten joint bolts, clean up after derailments, keep an eye on tie condition to get rid of the lemons, and watch the frogs and the points at turnouts. They will be the housekeepers—but they won't be the builders. There will be fewer of them, and they'll have the power tools necessary to do their jobs efficiently. And when their section of track is approaching the point where a major project is once again necessary—then, if our timing and planning is right—that's when our ever-marching system gang comes over the horizon again, just in the nick of time.

We're doing the same thing with rail—with an ever-moving steel gang. Happily, we cover enough north-south territory so these gangs can follow the sun. Good work programming will put them where they're needed, when they're needed.

And our branch-line gang in Iowa will continue as a branch-line rehabilitation system gang as well. They'll show up on every branch line we've got that's worth fixing (and that's most of them. We have very productive branch lines. We like them. They make money.).

This is our maintenance philosophy as of today, and with about three months of it under our belt now, and work laid out for the coming two years, we think it's working pretty well.

We're into other things, of course, when it comes to fixing the railroad. We are rehabilitating bad-order freight cars. We're rebuilding locomotives, and we are, this month, receiving the first deliveries of a fleet of 56 new GP-38's that are badly needed. We're all quite confident that we have turned the corner on the Rock Island—that we are over the worst part of a very rough experience.

Why save the Rock Island?

Now, before I finish, I have the responsibility to tell you why we are doing this. You should very properly ask—as a great many experts, politicians and bureuacrats have asked over the past couple of years—why on earth anyone would want to save the Rock Island.

I gave you a hint at the beginning of my remarks. I stated that we stand as an institutional barrier to an irrational and easy consolidation of western railroads. I don't say that's good, but it's true.

The reason our merger plans got so fouled up back in the 60's was that for every railroad that wanted part of us, therewas always at least one other railroad that didn't want the competition to get even an inch of us. We go to too many markets on railroad that's too flat and too straight. Whenever we want to merge with someone, that someone becomes a frighteningly competitive threat to everyone else. We have become what you might call "The Impossible Merger Partner," because total assumption of our routes would make somebody else much too rich, much too powerful.

New Act expedites mergers

Well, Congress has passed—and the President has signed—the Quadruple-R Act of 1976, the one that (among other things) expedites merger procedures and lowers a great many of the institutional barriers that fouled up western railroad merger plans in the past. We think—and I stress that word "think"—that socething good should happen for the Rock Island in connection with the new bill.

Let me list those "somethings."

First, part of our railroad might go to another company—and with the new law, that can happen over the objections of those who have hollered in the past.

Second, there's a possibility that **all** of the Rock Island might be sold. Chances are better now than they were in the past, and that's one reason why we are suing for inclusion in the MoPac "housekeeping" mreger case. If that occurs, then we want to be sold as a going concern at a fair price. We want to be sold as a railroad, not as a junk yard. That's only fair to our creditors and bondholders, and that's a good reason for fixing track.

One of the most amusing aspects of our MoPac inclusion case is the reaction of those railroaders who would rather fight than think. Hire more lawyers! Man the courtrooms! The fact is, inclusion of the Rock in the MoPac-Southern would vastly strengthen that coming system. And at a reasonable cost. Remember flat and straight?

A third possibility is that nothing may happen. We may still be the same 7500-mile system a year or two from now, and you can't get back on your feet and stand tall until you've bent over to fix the tracks. You can't plan for a future with a run-down plant—so we have a very good reason there to fix the tracks.

And there's a fourth possibility. If we do move toward reorganization on our own, we are still faced with the fact that the Rock Island, unmerged and unchanged, has gone into bankruptcy three times in its 124-year history. We probably ought to change our geography somewhat. We should probably then start thinking like buyers rather than sellers. After all, if the promises of the Quadruple-R Act ever become realities under future administrations, a reorganized and rebuilt railroad will be able to borrow money from Uncle Sam to expand its operations. And **that** gives us something to think about—and that is also one reason why it's sort of fun to be working on the Rock Island these days.

I will not expand on my merger philosophy anymore. As you can see, there are many possibilities and many different directions. I wish to thank you for the opportunity to be with you today. I hope you'll keep an eye on the Rock and watch us get healthy. In fact, you may even get a chance to watch us grow. Thank you very much. (Applause)

President Williams: Thank you, Mr. Ingram for taking the time to address our group today. I believe we all can understand now why the Rock is such an interesting place to work.

Mr. Ingram, we would like for you to stay for as much of our program as you care to. However, we realize you have a busy schedule. So, please feel free to leave whenevr you wish.

I will now turn th rostrum over to Mr. Dennis.

Introduction of B. M. Flohr

President Dennis: Our next speaker, who is Deputy Administrator of the Federal Railroad Administration, will talk on the RRRR Act, a progress report.

He joined the FRA as Deputy Administrator in September, 1975. Prior to that time he had headed the Southern Pacific Transportation Company, San Antonio Division, for four years. He has been with the Southern Pacific since 1965.

He is a native of Wallace, Idaho.

He received his Bachelor of Science Degree in Industrial Engineering at Stanford University in 1962, and his Masters in Industrial Administration at Purdue University in 1965.

He served in the U. S. Army as an Officer with the Corps of Engineers from 1962 to 1964.

He is affiliated with the American Association of Railroad Superintendents and is a member of Tau Beta Phi, Honorary Engineering Fraternity.

It is my pleasure to introduce Mr. Bruce M. Flohr. (Applause)

The Rail Revitalization Act

By BRUCE M. FLOHR

Deputy Administrator, Federal Railroad Administrator, DOT

It is certainly my pleasure to be here, and, to have the introduction that was just given. Another delightful part about it is to see several very familiar faces here in the audience whom I worked with during my years out in the field in the railroad industry. Now I have a little bit different role, which is the one of either being vaccinated to protect me against "Potomac fever," or maybe to inject me with a little bit more of the "Potomac fever." In either case, an experience in Washington, D.C., is a very delightful experience and, with what's been going on in the last several years, we all have to admit it is a place where the action is going on right now.

What I would like to do today is tell each of you a little bit of what the action currently is, what happened as a

Bruce M. Flohr

result of the Rail Revitalization Act that was recently passed, and then to get into some of the nuts and bolts of the regulations that are either in place or that FRA is contemplating during the next several years.

I guess we're running a little bit ahead of our schedule right now so, I would like at the end of my speech, if any of you have any questions you would like to direct to me, I will make the attempt to answer those questions. So, as we go through the various subjects I'll discuss today, jot down any thoughts that you might have that I could possibly expand on if you are interested.

Congress passed the 4-R Act

The first thing and I think probably the most important for all of us to discuss is the Railroad Revitalization and Regulatory Reform Act of 1976, which we finally all decided is better identified as the 4-R Act. This Act was signed in February and it hopefully will be one of several pieces of legislation that is really going to commit the railroad industry, (1) to be a viable industry, and, (2) to be an industry that will remain as a privately owned and operated industry.

The Act provides for $2.1 billion of federal investment in ConRail, which went into operation on April 1 as a private sector freight railroad restructured from six bankrupt railroads in the northeastern and midwestern region.

Now the April 1 date, many people said, "April Fool's Day—isn't this sort of an omen of what may come?" But so far, no one has been laughing. And I think it is creditable to USRA and the planning they did. It is also a credit to the people who worked on the Penn-Central and other bankrupt carriers and how they have all gotten together and what we have known as ConRail today is working and from the reports we are receiving now, it's working successfully. And this can only be due to those people to whom I gave credit and I think, also, the discussions that have been made even by the labor representatives.

Both railroad labor, as well as railroad management, are equally committed to making ConRail work. And as long as these attitudes remain, I think we can be assured ConRail will be a success and therefore the carriers in the United States will all be a privately owned and operated success.

Now how are these funds going to be spent for ConRail itself? It is going to be really a program over four years and much of its directed towards the track. Initially, we paid $309 million towards ConRail. This has resulted in rehabilitation in a four month period of June through July of over 200 miles of welded rail and over 1.7 million ties that have been installed. This is more than Penn-Central used to do in a full year.

To upgrade passenger service

The Act also authorizes $1.75 billion in federal funds over five years for upgrading intercity rail passenger service in the northeast corridor. The program will be managed directly by the Federal Railroad Administration with the work being done by many architectural, engineering, and construction firms, as well as by Amtrak. You have probably read in the papers recently some of the controversy that has gone on between Amtrak and FRA and the Department of Transportation as to just how this work will be divided up.

Ken Sawyer, the retired General of the Corps of Engineers, who is heading up the Northeast Corridor project, will speak to you tomorrow and I think he will enlighten you a little as to what some of the controversies and concerns have actually been in this area of jurisdiction between Amtrak and the Department of Transportation.

Hopefully, all these issues have been resolved and we are now getting started with the actual design and then the reconstruction work that will eventually mean we will have a 120-mile an hour railroad, we will have transit times significantly shortened from the current schedules, and, I think most importantly of all, we are shooting towards the goal of "On time Performance." By "on time" we mean within five minutes of schedule time and we're shooting for 90% "on time performance." Right now, we're using 15 minutes as a figure and the on time performance has been dropping. It was in the 70% and most recently it's down in the low 60's. Of course, a part of this has occurred as Amtrak has assumed the operation and control of the northeast corridor and some of the track condition problems have affected the schedule performance.

We have $50 million in fiscal year 1976 funds committed to the northeast corridor and for 1977 we're talking $150 million.

Will upgrade other railroads

Another major provision of the new Act established a nationwide railroad rehabilitation in improvement financing program in the amount of $1.6 billion, to provide needed capital for the nation's railroads, other than ConRail, for upgrading worn out physical facilities and encouraging desirable restructuring. Of this total, $1 billion is in the form of federally guaranteed loans and $600 million is the amount alloted for the purchase of redeemable preference shares to railroads.

The loan guarantee portion, for principal and interest, is theoretically available almost immediately. However, we realize these provisions contain several statutory impediments to its use by the railroads and therefore we are attempting to develop some amendments which could make the loan guarantee program much more attractive to the railroads. These amendments are part of what is now being referred to as the "sun of ConRail legislation" that's currently in Congress. Along with it they have tied in the Amtrak appropriation. Hopefully, they haven't muddied the waters too much so that some of the cleanup that is necessary under the Rail Act will not be passed this year. We are hopeful it will be so that the monies can be made more attractive to the carriers.

The $600 million for preferred share financing requires an appropriation, unlike the loan guarantees, and will be available in smaller amounts during the first year of the program. We have $70 million appropriated for fiscal year 1977 for the purchase of redeemable preference shares and $400 million in authority for guaranteed loans for fiscal year 1977.

Studies to categorize railroads

The 4-R Act also requires a number of studies and we have published one recently, titled, "Preliminary Standards Classification and Designation of Lines of Class I Railroads in the United States." In it we identified six categories of main and branch lines using standards. And these standards are density, service to major markets, appropriate levels of capacity, and national defense.

The study's primary purpose is to categorize the 193,500 miles of Class I railroads in the nation according to reasonable measures of priority, so that the investments in track can be directed where they will do the most good. It will also be used in conjunction with the forthcoming capital need study, which is required by legislative recommendations to Congress, so that we can go back to Congress with recommendations as to whether additional funding is necessary to insure financial viability of the railroad industry.

I'm sure each of you has been involved in some way with portions of these requirements because we have asked for much information from the individual carriers and I do want to take this opportunity to congratulate you for the promptness and the accuracy of the information that has been submitted. There is a lot of work that has been put in by the individual carriers under very short time frames and we do appreciate the work that has been accomplished. Hopefully now that work will be reflected in our reports and those reports will be reviewed by Congress in such a way that it will work for the benefit of the railroad industry.

The rail classification report that I just mentioned is both a preliminary report as well as what we hope will be the basis for our final report. That will be tied in with the capital need studies, both your current deferred maintenance studies as well as your projected capital need studies. These reports are due by July, 1977.

In the interim, the Rail Services Planning Office of the ICC will be holding public hearings throughout the country and they then will give FRA their recommendations for incorporation in the final report. As a matter of fact, one of those meetings is being held here in Chicago today.

Corridors of excess capacity

Perhaps the issue that I think has caused the most concern of any in that report is the designation that has been dubbed CEC, or Corridors of Excess Capacity. And even more importantly, where are those corridors of excess capacity, how are they selected, and what will the end result be? In other words, the theory behind corridors of excess capacity. I know Mr. Ingram is especially interested because the Rock Island ended up in much of the area designated as corridors of excess capacity.

Location-wise, we're talking about generally from Chicago, going over to Omaha, Kansas City, from Kansas City on down to Dallas-Ft. Worth, from Dallas-Ft. Worth on down into Houston. We're talking about Chicago, over to Detroit, Pittsburgh, to Buffalo. We're talking about from Chicago, going northwestward, up to Minneapolis-St. Paul. And we're talking from Kansas City-Omaha, out to the Denver, Colorado Springs, Pueblo area. These areas were selected as corridors of excess capacity based on the following criteria.

First, there were more than two competing carriers operating in the area designated.

Secondly, the potential operating capacity of all the through routes in each of the zones selected, that capacity exceeded the current traffic volume by more than 50%. As an example, we'll take the case from Chicago up to Minneapolis-St. Paul, where one carrier, the Milwaukee, has a capacity of around 100-million gross ton miles a year, and yet right now they are operating around 20 million gross ton miles. You throw that in with the other carriers that are operating in the same corridor, to summarize it all, and they come up with a figure that is much less than the potential capacity.

Now there may be an individual carrier and his route in the corridor is being used close to maximum capacity. In the case of the Union Pacific, let's take the example of the Pueblo-Denver on the west end and Omaha-Kansas City on the east end of that corridor. I personally talked with some of the Union Pacific officials immediately after our press conference concerning this report and they were concerned that on their route, going from Omaha over towards Denver, they had a capacity rated about 56, I think it was, million gross ton miles and they were operating at 52 million gross ton miles.

How in the world could FRA designate their line as being one of excess capacity? Well, the answer is, their line is not a line of excess capacity. But their line is in a corridor of excess capacity and that's what the critical issue is. Because even though their line is being operated close to maximum right now, what if they in five years may be having a big surge of new traffic, such as possibly sharing in some of the coal movements?

They might possibly come to FRA and ask for federal assistance to, say, upgrade the capacity of their line that is already being operated near capacity. Their application would have to be reviewed in light of what if that additional business might actually be operated over one of the other corridors or one of the other routes in that corridor, one of their own routes that is being under-utilized or possibly some other carrier's routes, through some kind of trackage right situation.

The idea is, is there a better way to maximize utilization without actually building a new railroad?

Now, how are we going to work ourselves out of this problem of corridors of excess capacity? I think part of it is the indication in the report, for those of you who have seen it, that had the corridors of excess capacity designated in green. There was a big discussion whether the line color should be red rather than green. It was decided green was really very appropriate because Secretary Coleman has publicly stated he feels that federal dollars should go towards those railroad facilities that will have their utilization improved and the policy that FRA is proceeding with right now is that if a carrier comes in with a program that will better utilize existing facilities through such things as joint facility operations with such carriers combining together, this is the kind of project that is going to get first priority for federal dollars. We must rationalize our railroad system.

Now at the same time, I don't want you to leave here with the impression that we would eliminate portions of the railroad. We have already been accused of this in our categorizing of our branch line category "B," those under a million gross ton miles. This is not the case at all. Even though a carrier like the Rock Island may have much of their trackage in the corridor of excess capacity designation, much of that track is potential "A" category main line trackage and we must have the majority of this trackage in service to serve those shippers located along individual portions of the route.

Let's take the example of the old Burlington-Northern, the Great Northern, Northern Pacific merger. They really have not discontinued service on any portions of their trackage but it was a classic case of a parallel merger. However, what the Burlington-Northern has done is to upgrade one route and yet maintained the other route as, say, Class 3 standards so that the shippers located along that route can receive the kind of service they need and that the carrier can give in an efficient manner.

So a case like the Rock Island, where it falls much in the corridor of excess capacity category, it really means that they possibly more than other railroads will have a greater chance of receiving federal assistance, but that chance must come through a plan where there will be improved utilization of all the routes or several of the routes in that corridor of excess capacity.

I have talked a little longer than I had anticipated on that particular subject, but I think it is important, not only for a carrier like the Rock Island, but one like the Katy, that also falls into the same area, and certainly as we're going out from Chicago, most all of you here in the room are touched in some way or another by this concept.

Aid for freight branch lines

Another part of the act was initiated recently when we proposed procedures for states to follow in applying for $11 million in federal rail planning and program funds under the National Rail Service Assistance Projects for freight branch lines.

The five-year national program affects states outside the 17-state northeast and midwest regions. A total of $360 million has been authorized by Congress for the program. A few comments on the two-year regional program in the northeast will help you in understanding the national program.

The Regional Assistance Program was an outgrowth of the Regional Rail Reorganization Act of 1973. And in addition to planning grants, provides money for use by the states for operating subsidies to purchase or the rehabilitation of little-used branch lines which had been abandoned and for the development of services which may be less expensive than continued rail use and by this situation of other operations that would be less expensive than continued rail use. What we're really talking about is, if the ICC does authorize abandonment of service into a community, there is money available by which they would permit upgrading of highway facilities, primarily bridges along several routes, primarily to increase wheel loading that would be required for improved truck service into that community.

Now there is a distinction between the regional program and the national program. The April 1 program, that being the regional program, as a result of ConRail being formed, was fashioned by Congress to help the states deal with the abandoned freight lines that did not become a part of ConRail. And this involved a little bit over 5,000 miles of trackage.

The national program was structured to cover freight lines where the Interstate Commerce Commission ruled that service may be abandoned, but only after February 5, of this year. As you will recall, USRA had total authority to designate abandonment situations for the northeast and midwest situations.

The federal participation for both programs is 100% federal dollars to cover the deficit in the operation during the first year and 80% the second year. At that point the regional program will phase over into the national program and the percentage share drops from 80% federal dollars down to 70% for year four and year five.

Opportunity to plan ahead

Perhaps the most important aspect of these rail service continuation programs is that they give the states a better opportunity to plan their total transportation requirements. This is why we are stressing planning grant funding as the initial part of the national program. The states have had the planning capability for some time in highways, transit and airports. Now they will have the ability to round out this picture for rail.

This is especially important for the railroads because as part of the Act, railroads now must submit to states a plan of each of your network in that state and then you have the possibility of designating lines that are potentially subject to abandonment. Because you have given the state early warning of areas where you are considering abandonment procedures, this will require the Interstate Commerce Commission to handle abandonment procedures in a faster manner than they have in the post. And I'm sure you are all familiar with some of the frustrations of abandonment requests that have extended on for a long period of time.

By permitting this planning to occur early on and by the carriers doing a reasonable job of designating lines that are potentially subject to abandonment, the Interstate Commerce Commission is going to be hard pressed to delay on making a decision. This decision may be for continued operation, but it will be only with federal and state dollars providing the deficit for the operation. And as a result it is going to assist many of your companies in eliminating lines that have been either marginal or just flat loosers.

Therefore, planning is going to be important and it is going to permit a much more rapid handling of abandonment situations than have occurred in the past.

FRA is conducting conferences

In connection with this planning, we are conducting a series of rail planning seminars at various locations around the country. The first of these 2-day seminars was held last week in Atlanta. And the seminars are being cosponsored by the FRA and the Council of State Governments. And I would encourage that each of your carriers be represented in these planning conferences, because the states are going to be coming to you anyway asking for such information as the condition of your trackage, as to the kind of traffic volumes moving over your route, and what some of your proposals would be should abandonment be proposed on a particular line.

We are having these conferences around the country. There will be one in Omaha starting on September 20th, in Salt Lake City on October 5th, Ft. Worth on October 18th, and one that is structured slightly differently will be in Albany, New York, on November 8th and 9th. The one in Albany will mainly be for future thoughts on how the northeast states would like to handle their rail service situation, because, after all, those states have already submitted their state rail plans as part of the program that is currently going on in the northeast.

Now, there is much more of the 4-R Act, things like regulatory reform, expedited mergers, talking about pricing policies, but I won't get into those because they are primarily areas that the Interstate Commerce Commission has the mandate to act.

I think as a bottom line summary of the whole Rail Act we can really say that Congress has spoken. One, they have stated that the railroads are important, they are willing to commit money for the revitalization of the railroad industry, and now for a change railroaders can stand up and be treated on an equal basis with the other modes that we have continually been competing against.

Now, we're still not doing as much as I feel we should be doing because we still have not seen some of the responses from an agency like the Interstate Commerce Commission, that has truly expressed the intent of Congress. But, I think we're moving in the right direction and as long as we can keep the attention of Congress that we will be continuing with both the success of the privately owned systems and returning to a greater market share handled by the railroad industry.

Let's talk about some of the other things that are going on currently within FRA, and maybe one of my biggest frustrations that has occurred in the last four or five weeks.

Modify track regulations?

Starting last winter, I was talking with people in the AAR and several of you from out in the field as to the necessity and desirability of modifying our track regulations. We have a golden opportunity right now to change our regulations in track.

The first of these is the fact we have had our regulations in force for about three years now. We have all gone through a learning curve, both from the industry side and from the safety side of the FRA. We still have about 40% of all derailments caused by track related causes. Of course, there are many reasons for this. But the frustrating situation is that the accidents due to track have not significantly decreased.

Along with that is the new reporting system that came along in 1975, and, now, of course, going on in 1976. I found that not only was there a big increase due to reporting changes primarily in the injury area, but that the numbers reported for the early part of '75 compared to the early part of '76 are still indicating a 30% increase when basically the reporting standards have stayed the same for '75 and '76. This is very dangerous, and it is dangerous for the reason that as we get into Congress for additional issues, we are not able to sell our programs properly.

Now, what are we going to do about it? One thing is, we're going to change our track regulations and we're going to tighten them in many areas. I could very easily see we would tighten our requirements as far as flaw detection, possibly getting down into lower classes of track, possibly looking for greater frequencies of inspection. But the thing is, we need your assistance and recommendations as to which way to go.

Now, similarly, we must loosen our regulations in areas that are not cost beneficial to you out there in the field having to do the work. Let's take the case of the article that Sperry published several years ago that was carried in most of the railroad trade journals, where they talked about the 10-mile an hour restriction that the regulation calls for when just about any common rail defect is found with the current capability of the flaw detection equipment we're all operating. And Sperry very definitely made a case for the fact that since the federal regulations have come into force, the utilization of their cars sad actually declined, mainly because the carrier was not willing to live within the 10-mile an hour restriction over night and yet they also didn't want to hold their gang overtime for changing out the defective rail.

So, what a carrier has done is to stop detection about one in the afternoon so that they can catch up on the rails being changed out. A very valid point, but certainly a point that was brought to the public's attention by somebody who had a partial interest to the whole situation.

We started talking here last winter, "Let's change our track standards. Let's look at this, let's look at things as the standard for Class I track, let's look at the standards for storage trackage, let's look at Class 2 standards, and such things as your spiral requirements, your cross level requirements.

Standards are not revised

So, what happens? We asked the AAR as the representative of the industry to come in on September 1 and give FRA what they felt were the changes that should be made in the track standards. And, gentlemen, you flopped when you came in on September 1. And I don't know whether there is anyone here in the room who attended that meeting, but I was gone at the time and when I came back I asked Bil Paxton and Ed English, who are the two people in Washington who are the most knowledgeable on track, "What did the industry come up with as recommended changes?" They said, "Well, really, we were complimented on our track standards." And the fact that the track standards that were put in place gave the industry a better chance to get more money budgeted for track than we've ever had in the past."

Now they also said, "Well, we'll come back in another three months and give you an idea of some of the things we might want to have changed." But three months turns into six months, turns into a year, and into two years. FRA can't sit around forever waiting for somebody to tell us where you think our regulations are wrong.

Now maybe you feel bound to have 100% agreement on something that you submit to the FRA. The AAR has this on several of their situations, and maybe you have it in some of your own committees. But that does not prevent you as individual carriers from submitting to the FRA what you feel are inappropriate track standards.

Now we're going to be tightening in some areas. We have to in our attempt to address this problem of the number of derailments caused by track. But now is the golden opportunity to loosen standards where the standards are not cost beneficial to you as individual carriers.

Use of track geometry cars

Another area as an example. We're starting to get more sophisticated with the use of track geometry cars. DOT has their own set of cars. At the other end of the spectrum we have something like the Iowa DOT who have their own inspection car. We get the intermediate type cars.

Is there any way that you would like to see the regulations modified to make the operation of a track geometry car more attractive to you? Could the geometry car be used in lieu of one of the visual inspections? Could you use the geometry car with its memory capability to cross reference conditions so that you can check for deterioration? Could you use the paper tape off the track geometry car in lieu of the current paper record keeping requirements that FRA has right now?

Where do our regulations cause you problems? And how can some of the new devices and techniques that are coming onto the market today be used to correct some of these frustrations and problems that you have with our regulations?

I'm begging you—give us your input—because it's the only way the federal government can respond at a time when we are committed publicly to responding to improving our regulations.

The Rail Safety Act

Now, another area I would like to address, and this is more specifically that of the Rail Safety Act of 1976 and what it's going to mean to each of you.

It's going to mean things like lodging locations.

Hours of service act for signalmen.

Markers on the rear of trains.

Why did all this come about? It came about because there are certain groups within the industry who are not only concerned about rail safety but are concerned about the work rules and work conditions that are going on within the industry. And I think they are very sincere when they let their thoughts be known. But at the same time the voting power within the railroad industry is within railroad labor. Right now, in an election year, railroad labor is in a very influential position when they go to Congress and ask for something.

This Rail Safety Act started out several months ago—in fact, last March. At that time, FRA testified concerning the provisions of the act at that time, or the bill at that time, and generally FRA opposed every portion of the bill, and even opposed a portion that go after the FRA on their safety regions. However, you have to realize that Congress is not only sensitive to votes, but Congress is not the best informed concerning railroad situations.

If they have a large group of people coming and talking to them and saying that things are good, that's the direction in which they are going to be swayed. And as a result, they have been swayed to mandate that FRA issue regulations requiring lighted markers on the rear of all passenger trains and highly visible markers on the rear of all freight trains, even if FRA does have quite a bit of difficulty coming up with accident reports that fully necessitate this full type of marker situation.

On the hours of service for signalmen, FRA was not even allowed to testify in Congress concerning this issue. But you are faced with it now. And FRA within the next three weeks will be issuing its proposed method of interpretation of this law. Not regulation. Hours of service is a law and as such, FRA is severely restricted as to how you can handle waivers to the law.

There are two big issues concerning signalmen. The first is what constitutes an emergency. I think you can imagine that those people who are involved say any type of operation of a signal system that is other than high performance should be considered as an emergency, even though the fallback condition would usually be a display of the most restrictive signal indication. And FRA is receiving a lot of pressure that would state that even though the signal system has gone to its most restrictive indication, this is an emergency situation.

The second part of the problem is concerning the on-duty type provision. If a man is working a normal shift at an assigned duty point, such as a shop area, there is no problem. But what constitutes on-duty for a signal maintainer that has a sealed maintenance responsibility, especially if he has been called out on a trouble call in the middle of the night, pulls up into his driveway at home and he gets a call on the radio that the dispatcher has a problem elsewhere?

The frustration here is that you are going to be required to maintain significant additional records over and above what you have ever had in the past. Records that will reflect who notifies the signal maintainer at the time that the emergency was designated. Who authorized it? What time was the man really called? Did the man make a reasonable effort to fulfill the requirements of the emergency at that time? In other words, did he immediately get out of bed and take off for the call or did he spend an hour and a half, which is reasonable call time as defined now for your operating employees?

It's a very thorny issue, but it is one that is going to be a reality for each of you. So within the next three weeks hopefully we will have something published that we are asking for public comment on. In this case, I will have to say that the AAR and some of the experts whom you have from the Committee have done an excellent job of informing FRA how they feel that these particular issues should be resolved.

Ask regulation for lodging

Another issue that has come up is the lodging issue. A case where the UTU had petitioned FRA some years ago for all lodging located at least a mile from switching activity. FRA did not take action on this. They came in with testimony concerning the rail safety bill. Yet, when FRA had discussed this before and all, what was the justification that was used? It was the Decatur accident, where the lodging facilities were actually located within the yard. Could it have been handled by negotiation by individual carriers? I would have liked to have said "Yes." But the interested parties felt it could not be satisfactorily handled that way and as a result it is in part of the Rail Safety Act. However, in this case the Safety Act requires that FRA come up with regulations within a 180-day period.

We are going to be coming out with them. The approach we are going to use is one that there would be a certain zone of so many feet where no new facilities or reconstructed facilities will be located.

There will be a second zone that would be subject to review, where you would have to look at such things as terrain configuration, methods of accessibility or exit from the facility if they were located in this gray zone. And then we would come up with a third zone that would be entirely free from any problem as far as federal regulation.

The zones that we are using will be based upon the accident data we have generated from some of the catastrophic accidents that have occurred, these primarily being the cases where flammable compressed gases have detonated in switching terminal areas.

In the area of reconstruction we end up with another problem. What constitutes reconstruction? Right now we're looking at it as if the improvements exceed a certain percentage of the replacement value of the structure, then this will be considered as reconstruction.

Let's talk about walkways on bridges for a minute. The UTU petitioned the FRA for a requirement for walkways on bridges over a year ago. I think it was a sincere thought on their part, not as much for safety as their desire to want to do a better job on getting the trains over the road. I think each of us in here at one time or another has been involved with a train that for some reason has been stalled on a bridge with no walkway. And as a result you have had to get the local electric co-op's cherry picker and drive down into the river bed to get up to replace that ruptured air hose or whatever the problem might have been, because you can't get out on the bridge.

So, it is a need and it is a need that is mandated more than just by safety. It is mandated by the desire of the operating employees to get their trains over the road.

How is this one being handled? Right now, I have discussions about every two weeks with Vice President Martin of the AAR. And the AAR is working closely with the UTU to see if an agreement can be reached by all the carriers so that FRA will not have to go the regulatory approach for requiring walkways to be installed on bridges.

We are committed that if you can resolve your problems between the various interested parties yourselves and resulting in a manner that is satisfactory to both parties, we're not going to get into the act. Because right now we have shelved, not put on inactive, but let's just say we put our proposed regulations in a holding pattern. Be cause if agreement can be reached, then we will not feel the necessity to proceed with any rulemaking in this area.

Changing track classifications

Another area I would like to talk a little bit about is the recent special notice provisions FRA came out with, which now give an FRA inspector the power to reduce the class of track that he has been inspecting. It also gives the FRA inspector the right to remove a car from a train.

Now he has always generally had this right as far as the locomotive is concerned for quite some time but the inspector has never had this right with either track or with equipment. What is it going to mean? Hopefully for you here in the room it is going to ease some of your own burdens and I know it's going to ease the burdens from some of the higher people in, say, like your attorneys or your legal area within your company. Because, we feel that giving our inspectors this ability will allow many of the problems to be resolved on a local level.

You are going to have your knuckles rapped as far as having the speed lowered, but I do not anticipate that as many cases will have to be progressed up through the Chief Counsel's Office in FRA for actual fine assessments. And yet, at the same time, it is going to give you as managers a closer insight as to where problems may actually exist in the field because you are going to find out about it that day or the next day rather than two or three months later when the paper work finally flows around through your office, saying that an FRA inspector took exception to a certain situation in one particular area.

Facilities at Pueblo

Let's talk about a little of the good news. That is our facility for accelerating service testing out at Pueblo. We have almost all the equipment out there. The track is basically finished at the present time. We are planning now that the facility will be up and fully running by the 23rd of September. It is later than I personally wanted to see it but it is earlier than what the original schedule called for. We will have it running at that time. We're planning our Engineering Conference on the 12th of October out at Pueblo, the 12th and 13th. A portion of that Engineering Conference will be a visit to the site to observe the train in actual operation.

We're talking about another ceremony out there in November, at which time we want to recognize all the individual contributors to the project. And as part of that we want them to see the actual operation going on.

If you can't make it to these other conferences, I ask that you do make it a point at some time to visit FAST when it is in operation. It's the industry's test bed and you'll get the benefit out of it by knowing what is currently going on and, also, to give us guidance as to what more we should be doing as we go into phase two, three, and four of FAST, because we are going to be having the additional phases.

So, in conclusion, let me say, a year ago, when Ace Hall spoke to you, it was still "what was the legislation going to be?" We had some ideas but we didn't really know for sure. Now we do know. We have the rail revitalization and a Regulatory Reform Act. We have the interest of Congress and we have the interest of the Administration. We believe the Act, as it has now been passed in many ways is far better than we had ever hoped for.

However, the implementation carries

with it a sense of urgency. We have already talked about the capital need study and the work each of you has done in providing this information.

The participation of persons such as yourselves is the one ingredient that is going to make the rail act a success. But it's going to be a success if we talk about continuing and implementing such things as consolidation where necessary before federal dollars will go into the trackage. But also, the upgrading of those tracks that are going to be deemed essential, even though no consolidation is involved.

We're talking about a regulatory reform. We're talking about track reform. But it will only be a success if each of you gives to the federal government the guidance that you have as the experts in the field in order to make it work. The timing demands it, the industry requires it, and our country deserves it.

Thank you very much. And, now, do you have any questions that I could answer? I will be around the rest of the morning and early this afternoon, so if there is anything more that you would like to ask of me, I will be here to answer it for you. Thank you very much.

President Dennis: Thank you, Mr. Flohr, for a very interesting presentation.

I will now turn the podium back to Mr. Williams.

President Williams: I would like to remind all of you who have your wives here to have them register today if at all possible, or at least very early in the morning, so that we will have a handle on how many buses we need and the whole information that our gentlemen in charge of ladies entertainment are going to need to have a successful trip for them tomorrow. So, early registration is really recommended so that all will be assured reservations.

Introduction of G. W. McDonald

Our next speaker joined the Union Pacific as Instrument Man in 1952. After receiving his B.S. degree in Civil Engineering from Kansas State University, he was appointed division engineer in Salt Lake City in February, 1968. He subsequently served as division engineer in Kansas City, Kansas, and currently in Portland, Oregon.

He holds professional registration in several states.

He is a member of AREA.

He will present an illustrated talk on "Redecking the Joso Bridge over the Snake River" by the track panel method. Mr. G. W. McDonald. (Applause)

Re-Decking UP's Joso Bridge

By G. W. McDONALD

Division Engineer, U.P., Portland, Ore.

President Dennis, President Williams, officers, members of the Association, ladies and gentlemen:

My topic will digress a little bit to a more specific problem on the Union Pacific as opposed to the excellent dissertations by Mr. Ingram and Mr. Flohr.

Union Pacific's Snake River bridge in Eastern Washington is on the main-line track, which stretches 188 miles between Hinkle, Oregon and Spokane, Washington.

This structure is referred to as the Joso Bridge which derived its name from the nearby Joso Sheep Company siding.

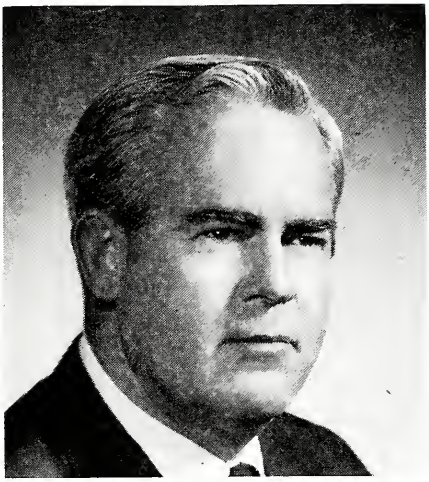
Union Pacific's Ayer-Tekoa Branch emanates westerly from the Joso Bridge at Ayer Junction and crosses under the west approach along the south bank of the Snake River.

The Sixth Subdivision main line to Spokane has ABS signals and carries approximately 11 million gross tons.

A six-degree curve is located on the west approach. The structure is 3,920 feet long and towers above the Snake River approximately 200 feet, and 320 feet above bed rock.

In the fall of 1975, 1875 ties were replaced by the conventional method of installation (singularly) at a total labor cost of $21.58 per tie.

Approaching this structure on the downstream side of the Ayer/Tekoa Branch, you are aware of the river level development by the U.S. Corps of Engineers in connection with construction of the Lower Monumental Dam on the Snake River, approximately 20 miles downstream.



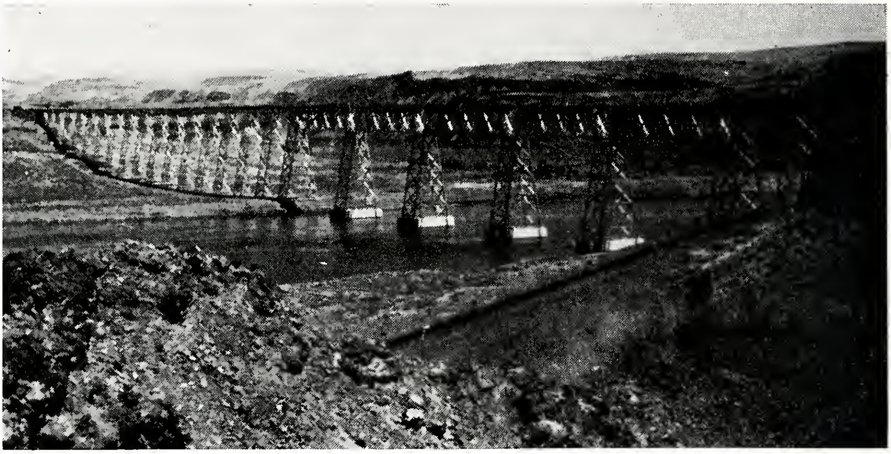
G. W. McDonald

This is a view of the Marina and on the right side of the screen is the Lyons Ferry highway bridge, placed in service in 1968, that replaced the Lyons "ferry" which had been in continuous service since 1860.

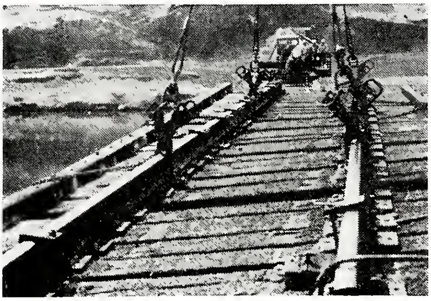
On the opposite bank of the Snake River is a recreational park that serves the people in this area. This view looks upstream on the Snake River at the confluence of the Paloose River coming in from the left. The recreational area is heavily used during the summer months.

Was outstanding bridge in 1914

This structure was originally built by the North Coast Railroad and the OWR&N at a cost of $1,050,400. The super-structure contains 15,818,570 pounds of steel and the pier and abutment foundations contain 16,830 cubic yards of concrete. Completed in 1914, it was at that time the longest and highest bridge of its type in the world. This picture represents construction in August 1914.



JOSO BRIDGE, when built in 1914, was said to be the longest and highest bridge in the world.



SPECIAL CLAMPS were fabricated to hold weaker ties to rail.

OLD TRACK PANEL was raised and crane backed up, avoiding swing.

The bases of the four main towers of the bridge were encased in concrete to an elevation 43 feet higher than the original piers in 1967-1968 by the Union Pacific, prior to the Lower Monumental Pool Raise at a cost in excess of $1,800,000. This cost was later recovered from the US Government in order to protect the steel towers.

The old deck on this structure was installed in 1943 and consisted of 10-inch by 16-inch by 12-feet bridge ties with a spacing of approximately 13 inches, center to center. The new ties are 10-inches by 18-inches by 12-feet long, with a 15-inch spacing.

As you will note, the aluminum paint is a result of a contract to paint this structure in the spring of 1975 at a cost of $228,000.

Special clamps hold weak ties

The project of panelizing the bridge ties has been given considerable planning and one of the major problems anticipated was whether or not the old ties would have sufficient holding power on the rail spikes and outside guardrail boat spikes to adhere to the rails sufficiently for removal from the steel. In this connection, we fabricated clamps to support the weaker ties to the rail before lifting was attempted. The raising of the old panel was also encumbered by the possibility of tight rail, due to

TRACK PANELS were built on shore, using template.

high rail temperatures, at the time this project was undertaken. Our first day resulted in a total of 3 panels of 31 ties each, being installed with a break in rail traffic of approximately six hours.

This picture illustrates the first old panel being reset after several ties, which were not secure, came loose. You will note in the foreground rail stops were installed to restrain the movement of the locomotive crane at the point where the panel is lifted.

Supervision of the panel removal and replacement was conducted by the B&B supervisor with a handie-talkie radio in communication with the locomotive crane operator and roadmaster, who was in charge of panel construction at the east end of the bridge. Raising the old panel and commencing the back-up movement 40 rail lengths to the east end of the structure was completed without any further complications. Subsequently, old panel removals were less difficult due to readjustment of rail expansion.

Equipment used

The breaking down of old panels was aided by the use of a truck crane in order to provide continued work space, as well as the reutilization of rail and tie plates taken from the bridge.

The new ties were placed on the panel jigs by use of a 25-ton locomotive crane. Each new tie weighed approximately 625 pounds and the ties were bundled in groups of four. The Douglas Fir, heart-free ties were framed and creosote-treated at the Union Pacifi Timber Treating Plant at The Dalles, Oregon, with 12% Arban treatment for fire retardant.

These pictures illustrate the construction of panels that was accomplished by 5 men, producing 1 panel in 1 hour. The use of an airhammer expedited the final spiking of the panel.

It was determined that the weight of a new panel, complete with rail and fittings, was approximately 12 tons and near the lifting capacity of the 50-ton Wellman Locomotive Crane used for this project.

This series of slides depicts the new panel being transported onto the bridge. As you will note, no attempt was made to swing either the old or the new panels while the crane was on the bridge.

Subsequent production, to replace the 1,240 ties remaining with 8 hours track time, was 6 panels on the second day, and 8 panels on the third day. Due to two hours train interference on the fourth day, only 6 panels were changed out. On the fifth day, 8 panels were replaced, and on the sixth day, 9 panels.

The cost estimated to replace bridge ties, by panelizing, resulted in a $3.50-per-tie labor savings.

Summary

It is questionable whether or not the panelizing of bridge ties on smaller bridges would provide the benefits we obtained in this project. However, due to the length of this structure and the extreme size of the bridge ties, a locomotive crane was necessary in either the replacing of the individual ties or the track panel method. Another major benefit realized was the greatly reduced overall time required for bridge gang as well as locomotive cranes in this operation.

Discussion

If there are any questions, I will attempt to answer them.

Member: Were the ties dapped at

the timber treating plant?

Mr. McDonald: Of course, at the gusset plate locations you do have rivets. However, we figured the tie would compress over these rivet heads, so we do not hand adz to allow for the rivet heads.

Member: How long were the panels?

Mr. McDonald: 39-foot track panels. We had 39-foot rail on the bridge.

Member: Do you stagger the rail joints?

Mr. McDonald: We staggered the rail joints prior to it. Of course, this added some additional cost to the project. We restaggered them subsequently.

Joints are staggered

Member: What kind of staggering did you do to make the new rails match the old rails?

Mr. McDonald: Generally, we measured over from the right-hand girder facing Spokane and located the rail with the carpenter square, so that we had a dimension for constructing the panels.

Member: Did you have a slow speed?

Mr. McDonald: Yes. We have a 20-mile an hour speed on this bridge. Of course, you can have some deviation in there. We will have good alignment on it.

Member: What kind of hardware did you use to hold the ties to the stringers or girders? Did you use hook bolts?

Mr. McDonald: Every third tie is clipped to the steel and the outside guardrail attaches all the time.

Member: Did you install the panels ahead of time?

Mr. McDonald: No, they were being constructed currently.

Member: This can be a problem with installing the hook bolts.

Mr. McDonald: The hook bolts, you say?

Member: Yes, sir.

Mr. McDonald: The hook bolts were installed afterwards.

Member: You couldn't put them in ahead of time?

Mr. McDonald: No. In fact, we did not install the extra timbers for the fire barrel refuges nor for the motor-car setoffs. They required 24-foot timbers and this would have thrown quite an imbalance on the panel as we tried to move across the bridge, so it had to be done afterwards.

Member: Was it jointed rail?

Mr. McDonald: This was all jointed rail. It remained jointed rail. We did not have CWR. Even away from the bridge, we do not have CWR.

Member: Did you have to take any extra precautions to keep the rail from expanding during the day, getting the new panel in and the old panel out?

Mr. McDonald: This is what I attempted to illustrate in one of the first slides, is the fact we did have a rather high ambient temperature when we started this project. When the ties were staggered, however, into track panels, we did make full expansion at that time in anticipation of this. But the problem was the adjoining rail on the west end of the bridge did run in on us, so we had to set the anchors on the east end of the bridge to restrain it as the day warmed up. After the first day, we did not have any further problems.

Construct a run-off

Member: As I understand it, there was two inches difference in thickness between the new ties and the old ties?

Mr. McDonald: Yes, sir.

Member: You just tapered off?

Mr. McDonald: Yes, at the close of the day.

Member: You didn't prefab the run-off panels?

Mr. McDonald: No, sir. We used oak shims and ran off the two inches on the last panels.

Member: How much time did you spend cleaning the tops of the ties?

Mr. McDonald: Well, of course, this project started in the center of the bridge, or roughly the center, 40 rail lengths from the end of the bridge, and the travel time for the locomotive crane was sufficient that we had plenty of time to get this accomplished without delaying it. So, generally it took about 20 to 30 minutes for a roundtrip on the initial panels. Of course, when it got closer to the end, it was different, but this did not become a big problem. We had men on the bridge who did this by hand. We did not sandblast the area.

Member: How was the walkway supported on the bridge?

Mr. McDonald: With the outlookers in the ties. We did not, like I pointed out earlier, install the outlooker ties at the time we were putting panels on the bridge. They would be installed later by hand.

Excuse me. I guess you said walkways and I was talking about barrel supports. The walkways will be of metal and there is a steel frame that is welded to the top of the steel, so it does not adhere to the ties. Pardon me.

Any further questions? Thank you very much. (Applause)

President Williams: Thank you, Mr. McDonald, for sharing this most interesting project with us.

As of 10:45 this morning, the registration includes 202 roadmasters, 71 B & B, and 87 guests, for a grand total of 386. That also included 26 members registered in both organizations.

We will convene at 1:30 this afternoon in separate sessions. The Roadmasters will meet in this room and the B & B will meet in Regency Room B.

I declare this session adjourned.

. . . Recessed at 11:35 A.M. . . .

President's Address

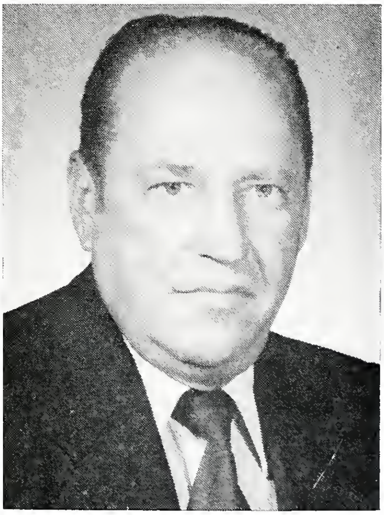
By J. R. WILLIAMS

Engineer of Bridges, CRI&P, Chicago

I hereby call this 81st Annual Convention of the American Railway Bridge and Building Association to order and to offer a cordial welcome to this our 41st consecutive meeting in Chicago. All guests and visitors are welcome to attend any and all of our sessions. May I also extend a sincere invitation for all the ladies to attend any of our sessions that may be of interest to them.

At this time, as required in the By-Laws of our Association, it is my duty to present a report to you outlining the general condition of our Association.

Our financial condition is good; we have a healthy bank account, most of our funds are invested in interest-bearing securities. A detailed financial report will be given by our Treasurer at the Business Session on Wednesday



J. R. Williams

morning. Although the cost of everything is constantly rising we have not had to raise our annual dues and hopefully this will not be necessary for some time to come. Our favorable financial condition is due primarily to the sales of advertising in the Annual Proceedings. The professional efforts of an advertising agency whom we have under contract has significantly increased our advertising revenues.

Our total membership is now approximately 700 compared to the peak membership of 968 in 1961. This decline can be explained in part by the overall decline in railroad employees nationally. I am sure, however, that most of us know of potential members, either new employees or recently promoted people that are eligible for membership. I urge each of you to endeavor to sign up a new member. Those of you who are in a position to do so are urged to acquaint your supervisors with the benefits of membership in our Association and encourage them to join.

I sometimes wonder if the general membership ever takes a moment to consider the amount of effort required to plan, organize and run a convention such as this. These meetings do not just happen—they are the result of a great deal of work by the Executive Committee and the Secretary. Immediately after the conclusion of this Convention an Executive Meeting will be held to start the planning for next year's Convention. Each member of the Board is appointed to one or more committees and given other tasks which require a great deal of attention. Without their cooperation and work, a successful convention and an effective Association would not be possible.

At this time I would like to introduce the members of the Executive Committee. I shall ask each member to stand as his name is called and it is requested that you withhold your applause until all have been introduced.

Beginning at my extreme right, our three Junior Directors are Mr. K. L. Wammel, assistant division engineer, Southern Pacific Company, Portland, Oregon. Mr. Wammel is a member of the Advertising and Registration Desk Committees and is the sponsor of the report on "Planning and Scheduling B & B Work."

Mr. W. E. Halley, manager fire prevention, Chicago and North Western, Chicago, Illinois. Mr. Halley is a member of the Ladies Entertainment Committee.

Mr. W. J. Gunkle, supervisor of structures, ConRail, Cincinnati, Ohio. Mr. Gunkle is a member of the Membership and Necrology Committees.

Our immediate Directors are: Mr. W. C. Sturm, senior project engineer, Elgin, Joliet and Eastern. Mr. Sturm is a member of the Hotel Arrangements and Publications Committees. Also, the Publications and Resolution Committees and Chairman of the Committee giving the report on "Problems Encountered in Remodeling Existing Buildings."

Mr. M. Noyszewski, bridge engineer, Illinois Central Gulf, Chicago, Illinois. Mr. Noyszewski is chairman of the Registration Desk Committee and a member of the Special Subjects Committee.

Mr. F. B. Lindsay, Jr., general bridge supervisor, Southern Railroad, Greensboro, North Carolina. Mr. Lindsay is Chairman of the Necrology Committee and a member of the Resolutions Committee.

Our Senior Directors are: Mr. W. E. Brakensiek, assistant chief engineer, Missouri Pacific, St. Louis, Missouri. Mr. Brakensiek is Chairman of the Public Relations and Convention Greeting Committee, and is a member of the Registration Desk Committee.

Mr. R. C. McMasters, engineer facilities and structures, Bessemer and Lake Erie, Greenville, Pennsylvania. Mr. McMasters is Chairman of our Advertising Committee and is a member of our Registration Desk Committee.

Mr. O. C. Denz, supervisor building maintenance, Chicago, Milwaukee, St. Paul, Chicago, Illinois. Mr. Denz is Chairman of our Ladies Entertainment Committee.

The Officers during the past year are as follows:

Our immediate Past President is Mr. J. J. Ridgeway, director engineering services, Bessemer and Lake Erie. Mr. Ridgeway has continued to serve our organization and is the Chairman of the Ad Hoc Committee on B & B Foreman Training.

Our Treasurer is Mr. W. H. Huffman, ass't. vice president and chief engineer (ret.), Chicago and North Western. Mr. Huffman is also one of our Past Presidents.

Our Third Vice President is Mr. J. R. Iwinski, ass't. chief engineer—structures, Chicago and North Western, Chicago, Illinois. Mr. Iwinski is a member of our Ladies Entertainment and Special Subjects Committees.

Our Second Vice President is Mr. J. C. Hobbs, chief engineer, Richmond, Fredericksburg & Potomac, Richmond, Virginia. Mr. Hobbs is the Chairman of our Membership Committee and is a member of our Public Relations and Standing Committee No. 1.

Our First Vice President is Mr. W. H. Rankin, senior structural engineer, St. Louis-San Francisco, Springfield, Missouri. Mr. Rankin is Chairman of our Special Subjects Committee and is a member of the Convention Program Committee and Standing Committee No. 1.

Our Secretary, Mrs. Ann Wilson, is unable to be here at this time because of her duties at the Registration Desk, but will be here for our Business Session on Wednesday morning. I am sure that I speak for all our Officers, Directors and Past Presidents in saying that we would be lost without our Secretary. She handles all of the myriad details of the Association and provides the continuity needed for continuing our affairs year after year.

You may now applaud.

Thank you gentlemen, you may now be seated.

We would like, at this time, to acknowledge the services rendered to the Association by three gentlemen. Mr. Merwin Dick is vice president and editor of Railway Track and Structures and has for many years been Chairman of our Program Committee. The excellent reports and speakers you have seen and heard are largely the results of his efforts. Merwin is also one of our Past Presidents.

Mr. R. E. Dove is the retired associate editor of Railway Track and Structures. Bob has the responsibility for editing and publishing our proceedings. Bob was President of this Association 35 years ago in 1941. Both Merwin and Bob are Honorary Members.

The third gentleman I would like to introduce is Mr. W. F. Armstrong, engineer of buildings, Chicago and North Western, Chicago. Bill is Chairman of the Hotel Arrangements Committee and also handles the publication of our News Letter.

It has been my privilege to serve as your President during the past year, and as a member of the Executive Committee for six years. I consider it an honor to have been selected for this duty, and the experience has given me great personal satisfaction. It is my intent to continue to serve the Association in any way that I can during the coming years.

Recognition of Past Presidents

The next item on the Program is one that we look forward to each year—the recognition of our Past Presidents who are here with us today. The introductions will be made by one of this select group. Will Mr. Runde please step forward and present these esteemed gentlemen.

Mr. Runde: As I read each name, will you please come forward and stand in front of the podium. The audience is requested to withhold its applause until all have been recognized.

Mr. W. H. Huffmann—1957-1958
Mr. M. H. Dick—1958-1959
Mr. H. M. Wilson—1965-1966
Mr. W. F. Armstrong—1968-1969
Mr. J. A. Goforth—1969-1970
Mr. A. R. Dahlberg—1970-1971
Mr. T. L. Fuller—1971-1972

Mr. N. D. Bryant—1972-1973
Mr. E. E. Runde—1973-1974
Mr. J. J. Ridgeway—1974-1975

Mr. Runde: You may now applaud. (Applause)

President Williams: Thank you Mr. Runde. It is always a pleasure to see so many of our past leaders in attendance.

We are now ready to present our Committee Reports and special features. These papers are the result of a great deal of hard work by many individuals. Following the presentation of the report you are invited to participate in discussion and ask questions. If you wish to make a comment or ask a question, please stand, state your name and affiliation and direct your question to the Chairman. Preprints of some of our reports are available at the rostrum for those who want them. If we run out of copies please leave your name and address with me or our Secretary and a copy will be mailed to you. All of the reports, of course, will be published in our Annual Proceedings which will be distributed by mid 1977.

Our first report is that of Special Committee No. 3 "History of Railroad Bridge Development on American Railroads." Mr. James Budzileni, assistant to engineer of bridges, CRI&P RR, Chicago, is Chairman, ably assisted by Mr. Tom Markvaldes, structural designer, CRI&P RR, and a number of Committee Members who furnished slides and data. Mr. Gunkle is the sponsor. Will these gentlemen and all members of the Committee present please come to the rostrum.

History of Railroad Bridge Development

Committee Report

COMMITTEE—JAMES BUDZILENI, *Chairman*, asst. to engr.br., CRI&P, Chicago, M. C. CHRISTENSEN, br.engr., C&NW, Chicago; J. W. DAVIDSON, asst.dir.br.engr., BN, St. Paul, Minn.; C. H. HAGUE, str.engr., CRI&P, Chicago; A. LIDDELL, buyer, CRI&P, Chicago; F. B. LINDSAY, JR., gen.b&b supvr., Sou., Greensboro, N.C.; T. MARKVALDAS, str.des., CRI&P, Chicago; W. H. RANKIN, sr.str.engr., SL SF, Springfield, Mo.; J. C. ROBERTSON, mgr.engr.des., B&LE, Greenville, Pa.; W. B. WARFIELD, PC, Towson, Md.; and R. J. WRIGHT, engr.br.des., Milwaukee, Chicago.

This report consisted of a slide presentation to depict a history of American railroad bridges. The committee reviewed 301 slides and selected 171 to be shown.

The presentation began with slides showing the early bridges built in approximately 1840. The slides were in sequence as to the year built.

The presentation ended with a picture of a 95-ft box girder with composite concrete deck built in 1975, a structure that received the AISC "Beautiful Bridge Award" in July 1976.

President Williams: Thank you gentlemen for an interesting presentation and a fitting one for our bicentennial year. You are now excused with the thanks of the Association.

Our next report sponsored by Mr. Iwinski, is titled "Oil Collection Pans" and is being given by Mr. D. R. York, environmental engineer, Chicago and North Western, after which Mr. E. E. Runde, construction engineer, Illinois Central Gulf, will show a film on pollution control. Will these gentlemen please come to the rostrum.

Oil Collection Pans

By D. R. YORK

Environmental Engineer, C&NW, Chicago

Our railroad has been constructing water pollution control facilities at our Mechanical facilities for the last five years as part of our systemwide program of pollution abatement. We presently have 43 of these facilities in operation and 5 more under construction.

All of these facilities can be described as collection and primary-treatment systems. The flow diagram shown illustrates our typical water-pollution control system. The major contaminants we are concerned with are solids, grease and oils.

Where oil spillage is high

The largest single source of oil spillage is at the locomotive fueling station. Even though all our fueling hoses are equipped with automatic shut-off nozzles, considerable spillage is evident due to leaks, dripping, overflow of engine fuel tanks, and sometimes a broken fuel hose due to engines being moved away while the pressurized hose is still connected to the engine. We have addressed this problem by providing collection aprons at the fueling stations to catch any spillage which might occur during fueling operations. We have used poured-in-placed concrete, prefabricated metal and a combination of both at our facilities. Since it is common practice to sand the locomotives while fueling or test the engine sanders during the servicing operation, considerable amounts of sand are also collected on these aprons.

We have provided grit chambers immediately downstream of our collection aprons to remove by sedimentation the sand, silt, mud, paper cups, and rags that get into the collection apron drains. These grit chambers are designed with removable grading tops to facilitate sediment removal either by manual operation or by means of a clamshell bucket. The inside dimensions of the structure are approximately 4 ft. wide by 6 ft. long with a depth below the outlet pipe to accommodate 3 ft. of sediment. The outlet is baffled to trap sediment, but small hoses are provided at the water surface to allow the floating oil to pass through for removal downstream.

The grit chamber effluent is piped by gravity sewer to an underground structure either metal or concrete, which we call a salvage oil tank. This tank operates as a sinple, oil separator and is of nominal capacity of 5,000 or 10,000 gallons depending on the amount of fuel dispensed upstream. The oily water enters the tank at the water-surface level of one end and a turned down decant pipe (pipe baffle) is provided at the other end so that the relatively oil-free water from the bottom of the tank is displaced as effluent by the oily water that enters the tank.

Detention time within the tank allows free oil to separate from the storm water that conveys it so that the oil layer in the tank builds up until all the water below it is displaced and the tank is full of oil and ready to be pumped into a tank car. (Hence the nominal 5,000 or 10,000 gallon sizing of the tank.) Shipment is either to our own reclaim operation or to a scavenger. The decant from this tank is piped to our main treatment system for further contaminant removal prior to discharge.

If the salvaged oil tank is not pumped out when it becomes full, oil begins to decant, but this oil can be removed by the skimming devices at the main treatment system. Since the first of these tanks was put into operation about 45 months ago and with the total number now in service being about 36, we have already pumped out 447,000 gallons of oil and each tank is in some degree of fullness, monitored by dip stick at least monthly, and scheduled for pumping as the oil level approaches the tanks oil capacity.

From locomotive wastes

In addition to fuel spillage at the fueling station, another source of industrial wastewater comes from the roundhouse or locomotive maintenance, inspection and repair area. Since this work is generally done inside a building, the flow consists of concentrated industrial waste with little or no dilution by storm water. The waste generated here includes lube oils, solvents, cleaning compounds, grease and detergent from floor washing. Drains and sewers are provided to collect this waste and conduct it to the treatment system. Special care is taken to isolate roof drainage and other uncontaminated storm runoff from this sewer system to minimize the quantity and fluctuations in flow rate that storm-runoff generates.

Main outdoor operations at Mechanical facilities result in drippage and spillage such as locomotive idling areas, journal-oiling facilities and car-repair areas. If practical, aprons, slabs, sheds, or buildings are provided or grading work is done to minimize tributary drainage area in connection with collecting contaminants from these outdoor operations. This becomes particularly important in southern regions where storm intensities are 2 to 3 times as great as those prevalent in northern regions.

Frequently, the accumulation of many years' past spillage results in large areas saturated with oil. The extent and depth of this saturation makes removal and replacement with clean material coupled with improved housekeeping, an impractical solution. Since stormwater runoff over these areas will become contaminated (polluted) prior to discharge, it is often necessary to collect large areas of drainage and convey the drainage to the treatment system.

In other cases, old drainage systems, sometimes quite extensive, must be picked up and treated if separation of clean and contaminated storm water is not economically practical. Unfortunately, many old drainage systems were designed primarily with the idea of getting the liquid (clean or dirty) to the nearest stream as quickly as possible. Today's EPA requirements have added other considerations to this idea.

Water from engine laundries

Another source of industrial wastewater at a Mechanical facility is the engine laundry. The purpose of engine laundries is to remove sand, dust, oily film, radiator boil over residue, and grease for the periodic inspections required by the company. To effectively remove these items, detergents (caustic, acid or some of both) are usually applied, then rinsed off with large quantities of water. To accomplish their cleaning purpose, the detergents emulsify or chemically breakdown the oil into very fine particles which makes oil removal extremely difficult. For this reason, if at all possible, engine-laundry wastewater should be isolated from the main treatment system so that oils from other sources are not emulsified by the laundry effluent.

The most desirable disposal method for engine-laundry wastewater is to obtain permission to discharge this waste to a municipal sanitary sewer system. To obtain this permission it is usually necessary to pretreat this waste prior to its discharge. We have installed for this purpose oil water separators which provide for sedimentation, some flow equalization, and free-oil removal by means of surface skimming. The skimmed oil is directed to the main treatment system for removal and storage with other oils removed. The reason a separate storage tank for this skimmed oil is not provided is to minimize the number of oil-storage tanks. At some facilities a separate tank for this oil may be justifiable. Another reason for isolation of laundry water is that if municipal criteria become more stringent, this wastewater lends itself to recycling which reduces expenses for water and also detergent.

The waste water collected from all the various sources is usually conveyed by gravity sewer to one point, which due to sewer gradients and lengths, is at an elevation considerably below grade, so that the waste must be listed by pumping.

Pumps are automatically operated

The pumps are sized to take the flow resulting from one-inch of runoff over the area drained in a 24-hour period. The duplex pump system operates with float controls. At a predetermined low flow level the first pump automatically goes on. When the flow becomes too much for the first pump to handle and it reaches another predetermined level, the second pump automatically goes on. When the flow reaches a predetermined higher level, both pumps go off and the entire flow is diverted to the ultimate discharge receiving stream or sewer system through an overflow opening in the structure. By this time most of the spilled oil has been carried to the treatment system and the ground surface has been flushed of oil.

It is assumed that at this time the surface runoff will meet stream criteria as determined by the EPA. When the rain ceases and the flow begins to drop, there is another level predetermined by a float control that starts both pumps in operation again, and when both pumps have taken the flow down to a predetermined level, one pump goes off and the first pump operates alone. When it has lowered the flow and the water reaches a predetermined lower level, this pump is automatically turned off. The theory being that all of the polluted drainage flow is always pumped to a lagoon system or to some other type of oil/water separator.

In some of the larger shops there may be more than one lift station which pumps water to a final lift station which in turn pumps the waste water to the main treatment system, which, in most of our facilities, is a two-celled lagoon. In rare cases, the waste water may flow by gravity sewers directly into the first cell of the lagoon.

As the water enters the first cell of the lagoon, the turbulence is quite high and the solids and oils are mixed excessively. The purpose of the first cell is to slow the water velocity sufficiently to permit the heavier solids to drop out and the free oil to float to the water surface for skimming, usually by means of a 24-inch-wide belt skimmer which drains to another salvaged oil tank.

Minimus detention time

The first cell is sized for a minimum detention time of one hour and an average of six hours as the waste water enters the second cell there is an increased detention time of six hours minimum and an average of 42 hours with even lower velocity to permit the settling of finer particles in the water. Experience with some lagoons has shown that biological activity can occur in the second cell, also to reduce the strength of the waste water. Normally there is no free floating oil on the second cell but some oils are released from emulsion or separated there during high flows so we have provided containment booms and surface skimmers to handle this condition. We have 33 of these systems in operation and have already pumped 378,000 gallons of skimmed oil from the lagoon salvaged oil tanks.

Water leaves the second cell through the effluent structure and usually passes through a sampling manhole or sampling station. Here, flow records are automatically made and samples obtained by our regional chemists to determine compliance with regulatory agency criteria.

The sampling station is usually housed in an 8-foot by 8-foot metal building or an 8-foot diameter manhole. The equipment provided includes a flow recorder with a 30-day strip chart for continuous flow measurement 24 hours per day. The flow is determined automatically by the meter which measures the change in head of the water upstream of the flume and records it in gallons per minute on the chart. These meters are also equipped with a totalizer for the calculation of total gallons of water discharged over any given period.

The waste water sampler used is usually a Trebler automatic. This is a scoop-type sampler which is used to obtain representative cross-sectional samples of the effluent for laboratory analysis. The sampling frequency can be set at any rate and is usually adjusted by the regional chemist to obtain a composite sample proportional to flow over a 24-hour period. On each pass of the scoop, a certain volume of waste water is collected which runs out the scoop base into a collection bottle for later pickup.

Besides the principal result of clean water, these facilities have a side benefit which is significant to energy conservation. We have recovered close to one million gallons of oil with the systems we have put into service that would have otherwise been discharged to streams and much of this oil has been reclaimed for our own use as boiler fuel.

Oil Pollution Control

By E. E. RUNDE

Construction Engineer, I.C.G., Chicago

The movie you are about to see is a super-8 home-type movie made up of scenes at various fueling and mechanical terminals taken over the past three years and spliced together in a sequence to show typical sources of pollution, various methods of collection and several methods of primary treatment of the collected pollutants.

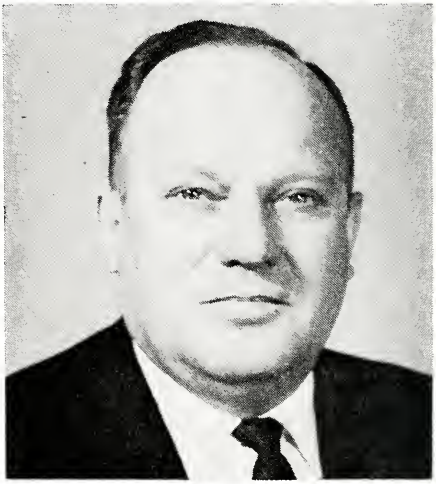
These first scenes will show areas of oil spillage which I am sure were typical of most railroads just a few years ago.

A fueling and sanding area. Note the dark areas of oil spillage. Every time it rained the excess oil was carried directly to the city storm sewers.

This is an inspection pit formerly drained directly to the city storm sewer system.

Note the shiny spot in bottom center. This is lube oil dripping.

This is a faulty fueling nozzle. Note the stream of diesel fuel, here being caught in a bucket, but not so in many similar cases. The nozzle can be repaired or replaced, but some spillage always can occur; if not from a faulty nozzle, from allowing a fuel tank to overflow by blocking open the automatic shut off.



E. E. Runde

Here, again, note the shiny spot in the bottom right center, which is lube oil dripping.

This is a truck fuel-unloading station. Note how it is conveniently located in a swale which will allow all spillage to go directly to the open ditch in the background.

This is an engine-laundry spray ring. Oily water and grease accumulations cleaned from the engines were allowed to fall to the track area and eventually were carried to the storm sewer system.

This is a typical two-spot fueling area. Spilled fuel was soaked up by the ground with excesses being carried off to the storm sewer system.

This is another typical condition. A ditch between two adjacent yards where track drainage and shop wastes from the Mechanical Terminal were disposed of. Note the dark oil-saturated areas.

The most economical solution in this instance was to design a pumping station that would handle all low-flow drainage or that from a one-inch rainfall in 24 hours over the drainage area and pump it directly to a two-cell retention lagoon. The pump station is constructed to permit bypassing directly to the stream of any storm water in excess of one inch in 24 hours, the theory being that at that time the major portion of oils and greases have been pumped to the lagoons and only the storm water is bypassed.

This is a concrete collection apron for unloading of fuel oil from trucks. This particular one is a pull-on, back-off apron. Note the evidence of oil spillage on the apron. Some spillage cannot be avoided; therefore, it must be collected. This is another, but it is a run-through apron and another.

This is a two-spot fueling apron under construction on the left and an engine-laundry apron on the right. Each facility has its own separation system.

Spillage on the fueling apron goes through a grit chamber where solids and floating material are trapped and then to a salvaged-oil tank where the water is decanted to a sewer system and then conveyed to a two-cell retention lagoon.

Engine-laundry wastes are conducted to a separator through a grit chamber and waste water is decanted to the city sanitary sewer system, as this type effluent, if mixed with oily waste, would emulsify the oils and negate the function of the two-cell lagoon system.

This view is of the grit chamber. The baffle plate shown will permit floating oil to pass through but will hold back all floating debris, such as paper cups, rags, etc.

The anchor bolts are spaced for every fifth tie to hold the track in alignment.

This is a single engine-fuel collection apron under construction. Note the sanding facility.

And this is the same apron after being placed in service. It is obvious that it is serving its purpose.

This is a double-track fueling apron.

And a panorama of the same location from the top of the fuel-storage tank adjacent.

Next we have a two-cell earthen retention lagoon under construction, almost complete. The two cells have been lined with a two-foot-thick layer of impervious clay.

This is a panorama, again from the top of an adjacent fuel-storage tank which shows the effluent structure, Cell No. 1 to Cell No. 2; the effluent structure to the sampling station; the influent structure to Cell No. 1, and the bridge to the oil-belt skimmer, not installed at the time of this picture.

This is another two-cell lagoon system with oil-belt skimmer in Cell No. 1.

In this instance there was sufficient space to construct the retention lagoons between the yard and mechanical terminal and all wastes flow by gravity to the lagoons. No pumping is necessary. The white line is the salvage-oil pipe line from belt skimmer to underground salvage-oil tank.

This is another Cell No. 1 of a two-cell system. Note the windblown location of the floating oil and the oil-belt skimmer way over here. Nature doesn't always cooperate.

This is another two-cell system where impervious soil was not locally available and the first cell is lined with hypalon rubber.

This is a two-cell system where space

was at a premium and it was necessary to construct the two cells of concrete. Same general principle as earthen lagoons but some changes in piping and all flow to Cell No. 1 is by gravity. This is Cell No. 1; this is Cell No. 2, only partially filled at time of this photo. This is the influent to Cell No. 2. The diffusion wall is slotted to slow down the flow and permit longer detention time for any oil that gets this far to float to the water surface. This is the baffle and weir trough at the effluent end of Cell No. 2. Any oil that gets this far is held back by the baffle plate and can be skimmed off by this movable skimming pipe and returned to Cell No. 1.

This is a typical sampling station. The sample scoop makes one revolution per minute or at whatever other intervals desired. Most of the sampling stations are located in an 8-foot diameter concrete manhole or inside an 8 foot by 8 foot metal building, but the operation is difficult to photograph in those cases so I chose this one which is located far enough south that no weather protection is necessary.

So far you have seen several types and sizes of concrete fuel-collection aprons and in the presentation by Mr. York you were shown fiberglass collective aprons.

This now shows a metal collection-pan system for a one-spot fueling apron that has been fitted with concrete sidewalk working platforms on each side. Note how the pan is fitted to the ball of the rail and the walkway grating at center and both ends.

This view shows the metal pan-collector at the effluent trough and in the middle background is the grit chamber, which also receives flow from the inspection pit at the left.

The white ribbed structure is a prefabricated oil-water separator 7 feet wide and 40 feet long. The baffle system inside is not easily filmed by an amateur such as myself, so I didn't try. The principle of the oil separation is similar to the other systems shown, but this type is designed for much smaller flows. This is the oil-belt skimmer.

You have seen in the previous views various parts of several oil pollution collection systems and now we'll take you through an eitire system from beginning to end. This is the engine fueling collection apron, sanding facility, the truck fuel unloading apron, an adjacent turntable pit, and an engine inspection pit.

All of these are connected to a sewer which carries the effluent to this pump station which pumps the oily drainage to this influent weir trough. Note the saw-tooth design to diffuse and slow down the flow.

The oil is picked up from the surface by this oil-belt skimmer and transferred to an underground salvage-oil tank. The metal baffle shown holds back the floating oil. A weir trough between this baffle and the bridge collects the Cell No. 1 effluent from which it is piped to the far end of Cell No. 2.

This shows the insulated and heat-taped salvage-oil pipe line from the belt skimmer to the salvage-oil tank.

This is Cell No. 2. Note the influent weir trough and floating baffle. Any oil that gets this far is trapped behind the baffle and will be removed by floating skimmer pump as required. The flow from this end goes back to the center wall between Cells 1 and 2 where it must pass under another baffle to another weir trough and then through the sampling station.

Note the clarity of the water coming out of the sampling station and being discharged to this stream. Our object is to have an effluent such as this from all of our fueling and servicing facilities.

President Williams: Thank you gentlemen for an interesting report and movie.

Our next subject is a continuing one that is being developed over a period of years. It is the "Development of Manual on Instruction and Training of B & B Foremen" by Mr. J. J. Ridgeway, director engineering services, Bessemer and Lake Erie, Greenville, Pennsylvania, Chairman.

Development of Manual on Instruction and Training of B. & B. Foremen

By JOHN RIDGEWAY

Director Engineering Service, B.&L.E.

As background information, for those who were not in attendance at the annual meeting last year, it was decided by the Executive Board in 1973 that they would develop a manual for training of bridge and building gang foreman. It was with complete realization of the tremendous amount of labor and time that was going to be required to accomplish this task that the program was initiated and that such a manual could not be developed in one or even two years. It was finally decided that an outline would be first developed to determine what information needed to be acquired and expanded for use in the manual.

This outline was given as an interim report by Past President E. E. Runde at the last annual meeting a year ago. This report is printed on pages 100-103 in the 1975 Proceedings.

The report for this year will be brief. It will cover only the first of the twelve topic subjects as outlined and given in Report One.

John Ridgeway

Obtain management sponsorship and approval

There is a wide and diversified set of parameters involved in this subtitle. These parameters must be carefully selected, listed and outlined. They must be scrutinized closely to be sure they are all inclusive and none carelessly overlooked or omitted. The success or failure of obtaining permission to install a training program will depend on the careful preparation of the package.

A survey will be required to ascertain the present and future needs of the required bridge and building foreman. The need will be predicated on the present age, years of service, attitude, and a projected turnover of the present force.

After the need is determined, short and long range objectives must be established. What is the purpose? What is the intent? What is expected to be accomplished? How are the objectives to be met? What are the benefits that will accrue to the company? What are the benefits to labor? What is the value to the company?

There will be some investment required and there will be other expenses involved. These monies must be determined as accurately as possible, for this is the keystone of the project; if an adequate return on investment is not foreseeable there will be no training program. After the costs have been fully established, it is suggested that they be broken out as cost per trainee. A further break-out should be the cost per remaining years of service anticipated for each trainee that will be put through the training program.

All of the past words, while few in number, contain a lot of weight and need careful consideration in developing a training program.

President Williams: Thank you John for an interesting Progress Report on this continuing subject.

Our next report is that of Special Committee No. 2 "Planning and Scheduling B & B Work." Mr. R. D. Force, assistant bridge & building supervisor, Louisville and Nashville, Louisville, Kentucky, is Chairman. The sponsor is Mr. Wammel, ass't. division engineer, Southern Pacific. Will these gentlemen and all members of the Committee here present please come to the rostrum.

* * *

Planning and Scheduling B&B Work

Committee Report

COMMITTEE—R. C. Force, *Chairman*, asst.b&b supvr., L&N, Louisville, Ky.; E. F. Grecco, *Vice Chairman*, supvr.engr., B&LE, Greenville, Pa.; D. J. Andrews, b&b supvr., C&NW, Greenbay, Wis.; R. Y. Carpenter, b&b supvr., Sou., Monroe, Va.; H. H. Hopkins, supvr.b&b, RF&P, Fredericksburg, Va.; W. R. Hyma, br.engr. sys., AT&SF, Chicago; F. F. Mascorro, asst.gen.fore.b&b, AT&SF, Ft. Worth, Tex.; J. F. Schmitz, b&b supt., MP, No. Little Rock, Ark.; L. S. Shryer, gen.fore. b&b&ws, AT&SF, Fresno, Calif.; R. Sliepka, sr.des.engr., EJ&E, Joliet, Ill.; and W. S. Stokely, sr.const.engr., ICG, Chicago.

Major bridge and building repair and construction projects must be planned and scheduled well in advance of the required work to allow for the design and purchase of necessary materials. The use of heavy equipment must be given consideration. The priority for these projects must be established. This can best be accomplished by the use of a five to eight-year planning program.

Most emergencies in the Bridge and Building Department can be eliminated by good and frequent inspection. A good inspection each quarter, with a thorough inspection once each year will give the information needed to plan the work. The annual inspection should be planned when the streams are low and piers and abutments are well exposed. Tools that aid in the inspection include a good heavy plumb bob, a 36-in. level, a welder's chipping hammer, a carpenter's hammer and a 6-ft. rule.

Weaher is a consideration

Consideration should be given to the type of job to be accomplished and the size of crew required. Jobs that require painting or extensive concrete work should be scheduled for warm weather.

On heavy-traffic main lines maintenance and/or construction of bridges requires the cooperation and involvement of superintendents, trainmasters, train dispatchers and Bridge and Building forces. This avoids delays to trains and allows completion of repairs or construction in the shortest possible time, thereby reducing the time that slow-orders remain in effect. The speed of trains must always be kept at the highest level consistent with safety.

There are conditions when the use of outside local contractors for maintenance work or new construction work must be considered when planning and scheduling the B&B work.

In general the contracting out of B&B work is governed by existing labor agreements. Labor organizations must be notified in advance when any work, large or small, is going to be contracted out. When regular B&B forces are at full seniority roster strength, use of outside contractors is often not disputed by the labor organizations. Maintenance work can usually be performed by outside contractors when the job requires equipment and skilled workmen not normally available from railroad's equipment and employee pool.

Some work demands contracting

Faced with having a large project to complete as soon as possible; having all company forces busily engaged on other projects which cannot be deferred; and not having the specialized construction equipment needed to perform the work; the only alternative is to contract the work. During the planning and scheduling stage one must first determine which projects are best suited for a contractor to economically perform. Bridges to be built on off-set alignments; large buildings; job requiring specialized equipment such as caisson boring rigs, large-capacity cranes and floating equipment are examples of the types of projects which should be considered for contracting. Jobs needing skilled tradesmen not on the railroad should also be considered for contracting.

When preparing the annual capital improvement program for bridges, we plan a year's work for a contractor along with work to be performed with company bridge-construction forces. By utilizing one contractor and giving or guaranteeing him a year's work we have been able to negotiate an open-ended, cost-plus, fixed-fee contract with a guaranteed maximum cost for each bridge project. This type of arrangement reduces the administrative work associated with contracting work. A basic contract can be entered into the first of the year and supplemented for succeeding projects during the year. This arrangement allows the contractor to schedule his equipment and forces to the benefit of the railroad. When selecting bridges to be contracted we always consider whether company forces will be available to do the work and compare the contractor's cost for doing the work with the cost of performing the same work with company forces. Selecting the bridges best suited for a contractor will result in overall savings to the railroad.

Local contractors can help

Small maintenance jobs such as repairing toilets, replacing windows and fixing light switches can most economically be performed by local contractors if a company repairman must travel a great distance to get to the job. It does not make sense for a water-service repairman to drive 100 miles to fix a toilet in a depot that is leaking or stopped up. The bill for a local plumber will be less than the cost for a company employee to drive the 100 miles. Railroads must continue to negotiate with labor organizations for the right to contract these small repair jobs.

In scheduling thought should be given to the movement of gangs on branch lines. Some projects could be deferred or advanced in the planning stage so that duplicating gang movements each year can be eliminated.

Derailments and floods can not be planned and will have to be worked around. These disasters often require to use materials on hand for another project. If this occurs then reordering of material and rescheduling the project will have to be done.

President Williams: On the lighter side we have a short address by Mr. F. B. Lindsey, general bridge supervisor, Southern, and Director of our Association "From the Past"—Mr. Lindsey.

From the Past

By F. B. LINDSAY

General Bridge Inspector, Southern, Greensboro, N.C.

The title of this report is "Creeping of Rails in Railway Tracks, Its Effect on Bridges and Methods to Prevent Injury to the Bridges."

"On all swing or drawbridges the rails are entirely separate and disconnected from the rails on the tracks on either side of the bridge and should be securely fastened to the bridge to keep them in their proper place.

"Our opinion then is that no spikes should be driven in the slots of the rail or splices on any bridge to prevent them from creeping, but that they should be spiked to gauge only and left entirely free to creep or expand or contract as much as they would, neither do we think that any mechanical device or contrivance of any kind whatsoever should be placed at or near the end of any bridge to prevent the rail from creeping, as, even if this could be done, it would only have a tendency to buckle the rail and cause a derailment of cars. A bridge is not intended to resist any end pressure, such as would be caused by the creeping of rails, and the effect it would have on the bridge would depend to a great extent on how securely the ties were fastened to the stringers. We have known the bents in a pile trestle to be pushed a foot out of plumb by the creeping of the rails. In this case the ties were securely bolted to the stringers, the stringers were also bolted to the caps and the rails were spiked to the slots. If the same state of affairs existed on an iron bridge, we can only say that the effects of the creeping rail would make itself visible at the weakest point. It might split the ties and get relief in that way, or it might slide the ties on the stringers, or, if the ties were securely fastened that they would not slide or split, it might, if the span was not very heavy, pull or push it off the abutment.

"We have thus far stated what should not be done to prevent the creeping of the rails, and endeavored to give some hurried reasons therefor, and now we will say that the way that we would recommend for preventing the creeping of rails, would be to spike them securely through the slots into the grade ties on the bank and if it was found that that was not sufficient to hold them, we would have as many additional slots cut in the flanges of the rails as might be necessary, and if we found that the rails were running or creeping for a mile or two miles, we would have the additional slots cut in the rails for that entire distance, and if it were found necessary, we would have slots cut out for every tie so that every rail would be securely anchored by itself which would prevent the tendency for buckling, which would be the case if an arbitrary attempt was made to stop the creeping at any one point, but under no circumstances would we ever allow a spike to be driven in the slot of a rail or splice on the bridge.

"Creeping of rails has been known to crowd or shove a bridge of a 154-ft span three inches endwise in one season, and a case occurred on the L. S. & M. S. Ry. at Goshen, Indiana. The rail was spiked in a slot in the splice at the first tie on the abutment and said tie was shoved eighteen inches to the west in the space of six months. Rail creeping in double-track railroads we think, is much greater and it usually occurs in the expansion of the rails working in the direction of the running trains to a very great extent. We have found that at draw bridges, it is necessary to hold the rails on the bridge firmly in their places and that all trouble came from the creeping of the rails on either side of the bridge and that it is necessary, at times, to take out and cut off a rail that is shoved ahead by expansion of track on one side of a draw bridge, and at draw bridges it is frequently necessary to wedge back the rail to keep a proper clearance so the bridge is clear and in proper order to swing at all times.

"Much more could be said or written on this subject, but we think it better to limit this article and not trespass on your time."

G. M. Reid, Chairman
J. B. Mitchell, Committee

Gentlemen, if the subject matter of this report seems to be out of keeping with today's standards, or a bit archaic, then well it should. We thought it to be appropriate, in the light of the nostalgia theme of this Bicentennial Year, to bring you something "From the Past."

This report you have just heard was presented to this august body at its annual convention in the year 1893.

I thank you.

President Williams: Thank you Mr. Lindsey for a report appropriate for the Bicentennial Year.

Mr. Noyszewski, one of our Directors, has obtained the film "Journey to Duke" which should be of considerable interest to this group. May we now have the film?

(Film was shown)

This concludes our Session for today. Tomorrow morning we will convene in Regency Rooms A-B at 9:30 for another Joint Session with the Roadmasters.

This Session is now adjourned.) Gavel 1).

MORNING SESSION

September 14, 1976

The Tuesday Morning Session, September 14, 1976, was called to order at 9:30 o'clock, Mr. R. E. Dennis, President, Roadmasters' & Maintenance of Way Association of America, presiding.

President Dennis: Will you please take your seats. Those at the doors, please inform the people standing in the hall that our meeting is about to begin.

Gentlemen, will the meeting please come to order. This meeting of the Roadmasters and the Bridge and Building Associations is now in Joint Session.

For your information, the latest registration count—Roadmasters, members, 197; Associate members 134; guests, 123; for a grand total of 454.

Bridge and Building, members, 91; Associate members, 19; guests, 61; for a total of 171.

Ladies registered, 104. Grand total, including all, 729, which is very favorable.

May I on behalf of the Roadmasters and Bridge and Building Association extend a sincere welcome to each and every one.

I will now turn the rostrum over to President Williams, of the Bridge and Building Association.

President Williams: Good morning. At this time I would like to introduce some of the officers and directors of the Bridge and Building Association and ask of them to stand as his name is called. The Balance of our Executive Board is busy attending to convention affairs. Please withhold your applause until all have been introduced.

Beginning at my far right:

Mr. K. L. Wammel, assistant division engineer, Southern Pacific, Portland, Oregon.

Mr. W. R. Halley, manager, fire prevention, Chicago & North Western, Chicago.

Mr. W. J. Gunkle, senior structure

inspector, ConRail, Philadelphia.

Mr. W. C. Sturm, senior project engineer, Elgin, Joliet & Eastern, Joliet, Illinois.

Mr. M. Noyszewski, bridge engineer, Illinois Central Gulf, Chicago.

Mr. W. H. Huffman, assistant vice president, engineering, and chief engineer retired, Chicago & North Western, Chicago.

Mr. J. J. Ridgway, director, engineering Services, Bessemer & Lake Erie, Greenville, Pennsylvania.

Mr. J. R. Iwinski, assistant chief engineer, structures, Chicago & North Western, Chicago. He is our Third Vice President.

Our 2nd Vice President, Mr. J. C. Hobbs, chief engineer, Richmond, Fredricksburg & Potomac, Richmond, Virginia.

Our 1st Vice President, Mr. W. H. Rankin, senior structural engineer, St. Louis-San Francisco, Springfield, Missouri.

You will meet the other gentlemen in a few minutes. (Applause) Mr. Dennis.

President Dennis: Thank you, Jack.

At this time, I would like to introduce the Executive Committee of the Roadmasters & Maintenance of Way Association—that is, some of them. There are a few who weren't here yesterday and there are a few repeats.

We have, at the far left, your left, my right:

Mr. K. W. Sutherland, supervisor, maintenance of way, CP Rail, Toronto, Ontario.

Mr. Gale is not here.

Mr. F. H. McGuigan, director, construction engineer, Missouri Pacific, St. Louis, Missouri. He's also Chairman of the Advertising Committee.

Mr. M. B. Mitchell, track supervisor, Southern Railway, Danville, Kentucky.

Mr. R. K. Pullem, 2nd Vice President, manager, engineering, Chessie System, Akron, Ohio.

1st Vice President, Mr. W. J. Cruse, chief engineer, Chicago, Rock Island & Pacific, Chicago.

The next two gentlemen, we will introduce as the program progresses. (Applause)

Introduction of R. J. Hansen

It is now my pleasure to introduce a gentleman whom we in Engineering & Maintenance of Way on the CN Road hold in the highest regard. He is Vice President of the Canadian National's Prairie Region with headquarters at Winnipeg.

He has had nearly 30 years of experience in railway engineering and administration in both eastern and western Canada.

Born in Acton, Ontario,, He is a university graduate in Civil Engineering, from the University of Toronto.

He joined the CN as a draftsman in the Engineering Department in Toronto in 1947. He advanced steadily and in 1956 was named terminal construction engineer with responsibilities for building the CN freight marshaling yard at Montreal.

He was promoted to regional engineer of the CN in the St. Lawrence region at Montreal in November of 1960, and to assistant area manager in July, 1963.

Two years later he was appointed manager of CN Hudson Bay Area with offices in Dawson, Manitoba.

In January, 1967, he returned to Montreal as deputy chief engineer.

In 1969 he was appointed system chief engineer in Montreal.

In July, 1951, he became assistant vice president on the Prairie Region at Winnipeg. He recently assumed the Senior Post on the region.

He is also vice president of the Duluth, Winnipeg and Pacific Railway.

He is chairman of Public Markets, Limited.

He is director of Canalog Logistics, Limited.

He is director of Canada's Safety Council.

He is a director of the Manitoba Sanatorium Board.

He holds membership in the Association of Professional Engineers in Quebec, the American Railway Engineering Association, Winnipeg Chamber of Commerce, and the Manitoba Club.

Gentlemen, may I present my senior officer, Mr. Ralph J. Hansen, vice president, CN. Prairie Region, Winnipeg, Manitoba, Canada. Mr. Hansen, please. (Applause)

Railroading — No Place for Amateurs

By R. J. HANSEN

Vice President, Prairie Region, Canadian National

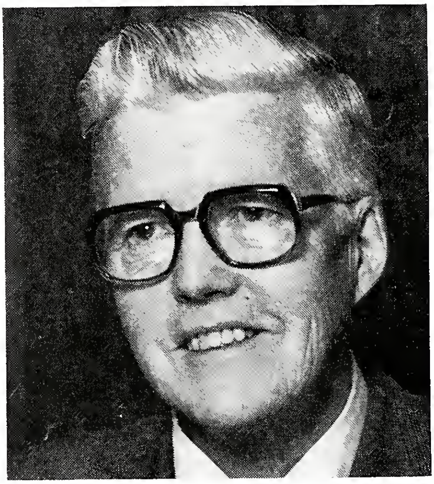
Thank you, President Dennis. And, for all those positions, I can only get one salary.

It's kind of fun being the first up in the morning here, with all you fellows out enjoying Chicago last night. If anybody holds their head too much, I'm going to use this.

I consider it an honor to have been asked to participate in this Joint Session, particularly because of my affiliation with the Maintenance of Way over many years. And, as most Canadian railroaders know, I hold the B & B and roadmasters in highest esteem. I also hold the AAR and its various committees in highest esteem. I am very firmly of the opinion that the railroads and the governments have long overlooked the excellent work that the AAR has done, and I am firmly of the view that greater use should be made of this excellent body.

I would like to extend to the American citizens present my best wishes for this, your Bicentennial year, and express the hope that the United States will continue to be successful and prosperous in the centuries ahead.

This year is the 140th anniversary of railroads in Canada. While CN has had a corporate life of only 53 years, its historic lineage dates back to the Champlain and St. Lawrence Railway, which was opened to traffic in 1836. Next year will mark the 150th anniversary of railroading in the United States. Because rail transportation has contributed so much to the economic, social and political life of both our countries, I believe it is only fitting that these anniversaries not be allowed to pass unnoticed.



R. J. Hansen

In Canada, for instance, where a relatively small population inhabits the world's second largest country, national survival depends to a large degree on the success with which we transport ourselves and our goods over the vast distances which separate us from each other and from the people who buy our exports.

Railroads are backbone of transportation

Given the distances involved, and the nature of our commodities, our terrain and our weather, rail transportation has been, is, and will continue to be the foundation of Canada's freight transportation system.

From its beginnings, Canada always has considered itself to be part of what we might call the free enterprise or capitalist system. However, Canadians are not inclined to get too misty-eyed or indulge in great rhetoric over the concept because, perhaps, we realize the system has weaknesses as well as strengths. Fundamentally, though we have felt that the best way to develop the industrial and commercial aspects of our country has been to give as much freedom as possible to the initiative and enterprise of individuals or groups of individuals. The approach has been successful in North America and, particularly in the United States, where, as I hardly need tell you, the free enterprise system, deservedly, can take credit for the development of the richest and most productive country in the world.

During this historical year, a plethora of verbiage about the railroads has developed, inspired, no doubt by the recently adopted 4R Act. While few will deny the importance of railways in our countries, those of us, who, as professional railroaders have devoted our lives to the business, must sometimes wonder how it has been possible for the railways to survive in the ludicrous environment in which they have had to operate.

There seems to be little general understanding that the transportation industry is extremely complex. People who have never shipped a ton of freight in their lives, who have no practical experience with transportation other than driving their cars to work are ready to proclaim themselves experts and propose instant solutions to long standing and difficult problems.

Such has been the burden on railway professionals. No other industry has experienced government regulation to the extent experienced by railways.

It seems to me that government regulation as applied to American railroads has produced one of the greatest ironies of all time. Because of regulation, rail profits were kept to such a low point over so long a time that funds were not available for the proper maintenance and upgrading of fixed plant. The attendant increase in accidents led to the creation of additional regulatory bodies whose job was to set and monitor maintenance standards. However the controls which had kept revenues low were not relaxed sufficiently to permit the generation of funds needed to do the work. Now at the 11th hour the Railroad Revitalization and Regulatory Reform Act of 1976 has been passed. From what I have read, the Act is seen as a mixed blessing. A sort of good news-bad news affair.

Government involvement

The good news has to be that the government seems now to realize that the advice professed to them by professional railway executives over many years was and still is good, sound advice, and that the U.S.A. needs a strong, efficient railway system. The bad news is not yet so clearly defined. It appears that the money needed by the railways may come from the public purse instead of through the commercial enterprise of the railways. If so, will this method of financing lead eventually to a loss of freedom for the professional railroad manager? Will the Act bring not only government financing and ownership, but also government operation of the railroad industry? Many of the top executives of U.S. railroads are expressing grave concern of the outcome of the 4R Act. If ever the government was inclined to listen to good advice from industry, now more than ever is the time. There is a grave and expressed concern that the 4R Act does not mean a return to railroading on a commercial basis as it should be, but further encroachment on railroad operations by regulatory bodies.

What is my interest in the U.S. railway industry? I could say truthfully that, as a Vice-President and a Director of the Duluth, Winnipeg and Pacific Railway, I have a very definite interest in what is happening in the U.S. transportation industry. But it goes beyond that. When a Canadian wishes the U.S.A. many centuries of success he is not being entirely altruistic. Canada's economy is tied so closely to the U.S., (you are our biggest customer) that as the U.S. goes, so goes Canada. I am convinced that the success or failure of U.S. railroads will reflect on Canadian railways.

Like yourselves, I have spent most of my working life in the railway business and I won't wish to see all of our efforts go for naught because of tinkering by well meaning amateurs in a complex business. Now that sounds like an over reaction but I am convinced it is not because there is enough evidence to prove that the most successful transportation systems in the world are those that are run on a sound commercial basis, not entirely exclusive of government regulation, but in an environment where government participation and regulation complements the railroad operations, and encourages and rewards initiative that is so inherent in professional railroad management.

Since I am a senior officer of CN, a government-owned corporation, one might ask if my comments about operating the railways on a sound commercial basis is coming from a strange source and I am just wishing that it were true. I can't over-emphasize that government-owned and government-operated are two widely separated matters. CN is government-owned, but it is not government-operated. CN is managed by professional railroaders, who operate the company on a commercial basis in competition with the CP, a privately-owned railway, and other modes of transportation. CN, like CP, is a total transportation system. We own or share in the ownership, or operate under contract of rail, truck and marine forms of transport.

CN has generated an operating profit in all but four of its 53 years of corporate existence.

During 1974, 19 of the 67 U.S. Class 1 railroads lost money and, in 1975, 26 of them finished in the red.

I mention these statistics to show that CN's management skills measure favourably with the best.

It has been claimed that an efficient, progressive and expanding railway system can be built and maintained in a modern industrialized country on a non-commercial and non-competitive basis—that is with no relationship between revenues and service and with operating losses subsidized and capital provided by the State.

Looks at Germany and Japan

Germany and Japan are two countries with well-deserved reputations for commercial efficiency and with enviable records in government economic policy. The undoubtedly good and progressive railway systems of these two countries are often cited as examples of railway systems which operate efficiently on non-commercial principles.

But what is overlooked here is the enormous cost to the State of such systems. According to the International Railway Journal of July 1975, the German Federal Railways (or Deutsch Bundesbahn) had a record deficit of close to three billion deutschmarks (more than a billion dollars) in 1974 and were heading for an even larger deficit in 1975. This financial result represented a continuation of a marked increase in the annual deficit of the German railways in recent years.

It now seems to have brought about a sharp change in policy in regard to investment in railway expansion and subsidies for freight and passenger services. The German government has cut back sharply on railway investment and has adopted a policy of making railways self-financing through increased user charges. The Government is stressing particularly that freight services are in future to be run on a commercial and market-oriented basis with federal subsidies being sharply reduced or phased out entirely.

Additional to these drastic measures to reduce the cost of the German railway system to the taxpayer are elimination of some services, a freeze on hirings and sharp cuts in expenditures on fixed installations, new rolling stock and experimental equipment and fixtures.

As a result of all this, the budget of the German railways for 1975 was reduced by more than eight hundred million dollars, and the expectation was that further cuts would be made in 1976.

In other words, the German people have found that operating a railway system mainly as a public service without regard for commercial viability was just more than they could afford. And the result has been a cut-back in the service and, by no means incidentally, a sharp reduction in the demand by the German rail system for services and supplies.

The story in Japan is much the same. In that country some showcase passenger lines make money. But the over-all deficit of the railway system is frightening—more than one-and-a-half billion dollars in 1973—and rising. One of the reasons for this has been explained by the President of the Japanese National Railways; also in a recent issue of the International Railway Journal.

He said that the Japanese National Railways are "deeply involved with national policy." He said also that this involvement requires the railway to provide extensive discounts for certain classes of passengers and "to apply low classification freight rates for specific commodities."

He went on to say that between 1945 and 1973 this burden alone cost the national railway system about four billion dollars and that the government lately has been persuaded to make some changes in transportation policy in order to have the users of passenger and freight services bear more of the cost.

The lesson should be clear to all of us. The route of non-commercial operation of railways may seem easy and, therefore, attractive at first. The railways can concentrate on service, no one need get upset about rate increases, suppliers have a wonderful time providing for expansion in all sorts of directions. But it is a system out of control, it has no checks and balances and when the point comes, as it inevitably will, that the whistle blows, then everyone connected with the system—the employees—the customers and the suppliers get a severe bruising.

I trust I have not conjured an image in your minds that Canadian railways are devoid of government involvement or regulations. The Canadian Government has been involved in our railway systems from their inceptions. The CPR was the instrument of the government of the 1860's and its construction from coast to coast was one of the terms of Confederation of the provinces of Canada into a country in 1867. The CPR received massive subsidies, land grants, tax concessions, etc., from the Canadian Government, but happily was permitted to operate the railway, which its successive managements have done with enviable success.

Competition is preserved

The CN was the product of Canadian government intervention to prevent complete collapse of many railways, some government financed and operated, but many privately financed and operated, in 1923. That year saw the formation of the Canadian National Railways with a financial structure that has been a burden on successive managements and which, unfortunately, obscures the results of an excellently managed corporation and leads to all kinds of misunderstandings among railroaders and non-railroaders about CN. During those difficult times in 1923, the Canadian Government made at least one excellent decision. The operation and maintenance of CN was placed in the hands of professionals and CN had the mandate to operate commercially in competition with CP. Early management of CN competed well and present-day management continues to do so.

Canadian railways are not devoid of government regulations. Far from it. From the very nature of our country and the railways early beginnings, government involvement was inevitable and also necessary. We have, however, inherited some anomalies that impede our commercial approach to life. One of the most serious is the Crows Nest Pass Rates established in 1890 for hauling grain to export points. This act was part of the deal in the financing of CPR. CN eventually was included in it also. Believe it or not, the Act is still in force and requires both railways to haul Canada's grain exports with today's costs at 1890 rates. To say it is primitive is an understatement. Losses reach the $250 million level per year.

Another problem is the passenger service. Canada is the second biggest nation in the world in size but ranks about 20th in population. Canadian railways by law have to operate a passenger service and have done so since their inceptions. Canada not only hasn't enough people using the trains but the trains must compete with the autos and buses and airplanes which have the benefit of highways and airports built with heavy subsidies paid by the taxpayers. The trucking industry also reaps the benefits of the subsidized roads and also enjoys the freedom of less Federal Government regulation than the railways. Where have you heard that before?

But the situation with rail transport in Canada took a turn for the better with the passing of the National Transportation Act in 1967—an Act that was widely acclaimed by U.S. railroaders as a major breakthrough for the cause of commercialism in place of regulation in railways.

Rates must be remunerative

Briefly, the National Transportation Act of 1967 states that the railways must be allowed to charge rates for traffic that will be remunerative. It also states that if in the national interest certain services must be performed, the railways will be reimbursed at least their costs for such operations. However, it has not been all roses since 1967. While great debates on what railway costs are have raged on ever since, enactment of the legislation was a start and a solid foundation on which to build. CP and CN have been paid some subsidies for unprofitable operations. These include payments for money-losing passenger services and also non-profitable branch-line operations, but not for hauling grain at Crows Nest rates. That loss goes on.

However, a ray of hope is seen as a result of two extensive commissions (studies if you wish) directed toward rationalizing the grain-gathering branch lines and determining the real cost of hauling grain. The work of both these commissions is expected to be completed by year end. Much of Canada's grain-gathering railway network is in a poorly maintained state—that's an observable fact. Both major Canadian railways lose massive amounts of money on this operation—that is a fact—how could it be otherwise—1890 rates and 1976 costs. What is now being debated is the extent of the loss and hopefully, when that is established, how can it be eliminated.

What is astonishing to Canadian railroaders is the naivety shown by non-railroaders who cannot understand why grain branch lines are under-maintained. It's a case of no dollars—no maintenance. A state of affairs which if carried on for too long, will result in no branch lines. Has not a parallel situation occurred in the United States, not because of ridiculously unremunerative grain rates, (U.S.A. rates are remunerative)—but because rates in general are too low to generate the dollars needed to keep the railroads viable.

Will the amateurs never learn????

Where do we go from here? U.S. railroads have their 4R Act and Canadian railways look forward to the results of those two important commissions. There now seems to be an understanding that the railroads have financial problems. How these problems are solved is of concern to all professional railroaders. Will the problems be solved on a commercial basis or by government subsidy? Will management of the railroads be usurped by government or left, as it should be, in the hands of the professionals?

We, in CN, believe we should be allowed to operate on commercial principles because that leads to efficiency and economy in day-to-day operations and makes the best use of the capital available for improving the transportation system.

Government encourages railroads

At CN it is our hope and belief that a large element of market discipline and commercial competition will continue to be present in the Canadian transportation system and that, Canadian railways will be encouraged to make their own decisions in regard to how the expansion and improvement of mature parts of the railway system will be financed.

In this context, we have been encouraged recently by the attitude and remarks of Canada's Minister of Transport, the Hon. Otto Lang, who has stated publicly that he favours a good measure of commercial competition in the transportation industry.

Here are some parts of what Mr. Lang said in a recent interview in response to a question about his views on the value of commercial competition between various modes of transportation. He said:

"I tend to believe in competition in industry wherever it can be introduced. Simply because I believe that by allowing a couple of people to demonstrate whether they can do a job well you get them both challenged; and by rewarding them a bit for doing it better than other people are doing it you continue those challenges . . . I therefore tend to lean in favour of keeping our regulation of the transport industry as much to a minimum as possible. There are areas where there can be no competition and there, of course, you need some sort of control or regulation or government action. But where there can be in fact competition, where you can free the very keen people, the very intelligent people, who are in the transportation business, and let them go on and do the best job they can; I think that is what you ought to do."

We in Canadian railways have been encouraged by Transport Minister Lang's comments and the actions that are flowing from his policies.

I hope U.S. railroaders will receive similar support from their government leaders.

President Dennis: Gentlemen, I'm sure you see the close parallel of problems that exist between some U.S. railroads and the Canadian lines. Thank you, Mr. Hansen, for taking the time to be with us today, and for your very timely and pertinent message. You are most welcome to remain for any or all the balance of this program. If your busy schedule will not permit, however, feel free to leave at any time if you must.

I will now turn the rostrum over to Mr. Williams.

Introduction of Carl Winters

President Williams: The Bridge and Building group gets the most exercise, the way they set this rostrum up.

Our next speaker, by his own admission, is an Indiana farm boy. He really won't need an introduction to many of you since this is the fourth time that we will be honored with his inspirational talks.

He was a Baptist minister for over 30 years having headed the 1st Baptist Church in Oak Park, Illinois.

While he was a minister in Michigan, he was appointed Chairman of the Michigan Crime Commission. Later in Chicago he served as Chairman of the Skid Row Commission. It was in this latter position that he became acquainted with railroaders. (Laughter)

He has traveled around the world many times on assignments dealing with crime prevention and criminal rehabilitation.

He's been listed in Who's Who since 1959. He has devoted his full time to writing, lecturing and traveling assignments.

Now, with considerable pleasure I present to you the distinguished Dr. Carl S. Winters. (Applause)

Create Your Own Tomorrow

By DR. CARL S. WINTERS

Mr. Chairman, Mr. Hansen and very distinguished platform guests:

I wasn't going to make any mention of railroading and skid row, but since I heard about some of you boys last night it reminded me of when I was a minister, I had so many members of my congregation who spent all night sowing their wild oats and then would come to me and pray for a crop failure.

I'm delighted to be back with you. You know, I've learned a lot from you people. Two years ago when I was here one of your railroad men gave me a little verse that may be repeated. He said:

"I'm not allowed to run the train,
The whistle I cannot blow;
I'm not allowed to say—
How far the railroad cars can go.

I'm not allowed to blow off steam—
Or even clang the bell;
But let that damned train jump the track
And see who catches hell!"

It seemed to be as I listened to Mr. Hansen, you have problems, still have problems. It may be two years since I was here with you but we still have confusion, we still have the governmental problems, we have personal problems.

Dr. Carl S. Winters

Do you recall the times in history when they were just coming onto the excited scene of railroads? Even in the literary world, people were amazed. Ralph Waldo Emerson was so thrilled about railroads, but Henry Thoreau wasn't. And when Ralph scolded Henry for not being excited about it, he said, "Railroads don't make the world any better unless good people ride them. Otherwise, it's just meanness going faster."

Well, the battle still goes on. In this little Ohio town, when the railroads first started going through they had quite a problem of traffic. There was a little town where there was a track that took them one way and another took them the opposite way and they had a law, you see, you couldn't go faster than 15 miles an hour because it would hurl, as the minutes of the meeting said, "Hurl your eternal soul into hell," if you went over 15 miles an hour. And they proved it was impossible. And with the problem of getting these trains through the little town going in opposite directions cause them to pass this law—"When two trains are approaching each other from opposite directions, they shall both stop a quarter of a mile away and neither shall move until the other has passed." (Laughter)

So, as I listened to Mr. Hansen today, I thought, "Well, we still have confusion and we still have conflicting orders and we still have our problems.

Well, gentlemen, I can't talk to you about railroading really, although it's one of those great things I put some taxes in because we in the United States are also in financial trouble with automobiles.

There are two things in the world I don't mind paying taxes for. One is good highways and railroad and the other is good schools—and, believe me, I pay taxes for them. I bought a home in Oak Park 16 years ago and my taxes out there at that time were $1600. I got my bill the other day and they are $4100—in 16 years.

Government regulation

And when we hear of great industries, when we hear of the whole setup of what Mr. Hansen just talked to us about today, some of the trends, some of the problem, some of the lacks of control, I could say something about it automobile-wise, but I don't want to because somebody in General Motors might hear about it.

Yet we are in dictatorial problems in automobiles, on energy, which is an important matter, on size. I think General Motors has probably just committed a $300 million error, on styling, because of brow-beating from governmental agencies. Which causes me to say what I seem to feel a bit in Mr. Hansen's wonderful address, that somehow we're coming to a point when we've got to have masters running our own business, not elected officials totally ignorant in our field dictating our own business. I think this is a problem both in the United States and in Canada.

I love my country, and I always think of my country, Mr. Hansen, as Canada, too. I was lecturing at Toronto and Ottawa yesterday and I can't separate the two great countries except that I am the No. 1 propagandist for the development of Canada. Here you have the second biggest country in the world, with only 23 or 24 million people in a kind of riches that is mind-boggling. And I just hope for them, as I hope for my good, loved land, that you can solve your colossal problems.

I suppose you have confusion up there even among government men. I was in Earl Butz' office not long ago. I took over Earl's work in General Motors when he went in there. It sort of reflected our government confusion. On his desk was this:

"Which way did they go?
How many were there?
How fast were they traveling?
I've got to find them, I'm their leader."

I got off my plane the other day in Atlanta and was going downtown to the tallest hotel in the world, which is in Atlanta, not Chicago, and here was a fellow pulling a big trailer in front of me, and on the back end of it was this sign—"Don't follow me—I'm lost."

And I thought, well, in this crazy, cockeyed world we have to face a lot of these problems.

Today, of course, I can't talk to you about railroads. I can talk about something that's more important, however, and that's you and I've called it, "Create Your Own Tomorrow."

This is a kind of a down-beat time. One of the most delightful stories I like about our town and our time is this one.

A mother came in one Sunday morning and said to her son, "Get up, Jimmy, you've got to go to church."

He said, "I don't want to go to church. I don't like the official Board."

She said, "That doesn't make any difference, Jimmy, you've got to go to church."

He said, "I don't like the choir. They sing off key."

She said, "Jimmy, now you get up and go to church."

He said, "I don't like the Sunday School kids. They have no respect."

She said, "Jimmy, now you get up and go to church—you're 41 years old, and you're the minister."

And, so, when we get a little kind of discouraged about our individual problems, I've just finished my second year and now have been deposed, as the National President of the Speakers of America. And, of course, we platform men are a nuisance sometimes. We can be so dry, and especially preachers.

I used to have a teacher who said, in my divinity school, "If the congregation goes to sleep, wake up the preacher."

Another one said, "A Minister is a man who talks in other people's sleep."

And one of the stories I told Paul Harvey—and you may have heard him repeat it the other day—I was having a baptism and Paul was supposed to be there as a guest and his Lear jet was late. So I waited, and I told him my story and he repeated it. But I love it.

The Minister on Saturday afternoon was putting names over the altar up in front of the church. Jimmy, the little 6-year-old, was watching his Minister in great curiosity about what he was putting up there. And finally he said, "Reverend Jones, who are those people whose names you're putting over the altar?"

And the Reverend Mr. Jones said, "Jimmy those are the names of the people who died in the service."

Jimmy said, "Which service, the 9:30 or the eleven o'clock?"

Well, I didn't come here to tell you stories, really. I came here to share with you something which I think is of vital importance. And let me begin with the theme that Mr. Hansen said and used. This is no time for amateurs. We've just had Olympics up in your lovely land. I've been reading two great books recently of great coaches. One, Johnny Wooten, who was a neighbor of mine down in Indiana, growing up when I was a Minister down there, only six miles away. And the other, Vince Lombardi. And I got to thinking about one of my fellow lecturers, Art Holtz, if you ever get a chance to hear him. He's an umpire in the NFL. One night he was showing some of his athletic pictures, and a lovely lady watched the hitting in football and was a little squeamish about it, and at the end of the pictures she said, thinking of the cruelty of the battle of football, "I wish football was more like life." And Art Holtz looked at her and said, "I wish life was more like football. A hitting—it's not the contacting."

He had this in mind. Somebody asked Vince Lombardi, what did he do that made him a great victor on the football team field with his men. What does he do? Somebody said, "He does the same things other men do, but he does it better."

It was Bart Starr who said, "All he expected of us was perfection."

And Lombardi said, "Football is a game of inches."

Why should anybody be so crazy as to care about a minute thing like an inch? Well, an inch, if you've seem them measure out on the field, makes a difference of whether you get another chance of several more downs. He taught them the second effort.

I wish we could get into industry, and

into the business world, this sense of perfection. As a clergyman, I read my Bible and I read the Alpine peak of ethical insight in the Sermon on the Mount, when it says, "You must have absolute love, absolute honesty, absolute purity, an absolute loyalty," and then it comes to the end of that great spiritual insight and says, "Be ye therefore perfect as your Father in Heaven is perfect."

We must have masters

Now the thing that comes to my mind after listening to Mr. Hansen is, in all the industrial world where we struggle to make both ends meet—and then, as somebody said, somebody moves one of the ends—but in the entire economic world in that struggle, we have to have masters, we have to have geniuses in the field to untangle the stupid, self-defeating headlocks in the industrial and government world today.

We can thank God for our great governments but each one must have an expertise in a given field.

Taxes are not new. They were grumbling about the taxes in the days of the founding of this nation 200 years ago, and one day when someone had jumped all over old Ben Franklin about it, he said this: "Taxes indeed are heavy, but if those levied upon us by the government were all we had to pay, we might easier pay them. But we are taxed twice as much by our idleness, three times as much by our folly, and four times as much by our sins."

He wasn't denying the problem but he was coming back to those people 200 years ago and saying, "You answer this outward problem by an inward development."

This is no time for amateurs in the athletic field, in the field of competition or in the field of the magnificent business in which you men are involved.

I opened the 500-mile races four years ago and it was a fantastic thing to me to see in this most grilling, challenging, dangerous but skillful event of all athletics in the world. And the winner won—500 miles of grueling drive—and the winner won by three seconds. Isn't that fantastic? They are skilled, they are experts. Well, you can win or lose.

I like that, Mr. Hansen. Remind me to raise your salary!

Now, on that, let me say here, you see, you and I today as fellow Americans, as fellow citizens, as human beings, which is the only area in which I have any expertise at all. There are two things we need very, very badly. Because tomorrow when you go back to work you are a railroader, you are a bridge builder, you are a highway worker. Yesterday, circling the beautiful city of Toronto and going on to Ottawa, we backed up on the highways out there.

Well, now, I knew it was a great, new, fine, four-lane highway going in each direction and we got all backed up for a half hour. Why? Because a guy had stopped at a liquor joint and had four drinks and he turned his truck over right square in the middle of the highway. You see, the trouble was not the highway—it was a beautiful highway—the problem was the man, the human being.

Isn't that our story? There are two things we need. Each one of us needs to succeed in this world of ours and be an expert, not an amateur. We need a philosophy of life and we need a religion of life: Catholic, Protestant, Jew. The two of them make the difference in what kind of person we are, an amateur or an expert.

I think I told you two years ago about a little girl, Fanny Crosby, who was totally blind and whose church was having a bazaar and everyone was to give something. And this little 8-year-old girl had nothing to give. She decided she would write a little verse about her philosophy as a blind girl and sell that, and the little verse she wrote was this:

"Oh, what a happy soul am I
Although I cannot see.
I am determined in this world
Contented I will be.

How many blessings I enjoy
That other people don't,
To weep and sigh because I'm blind
I cannot and I won't."

Now this was her philosophy—this was her tough little will. She wrote 150 beautiful religious songs that you will find in your song books on Sunday morning. And in that she summed up her religion in which it says: "All the way, my Savior leads me. What have I to ask beside? Can I doubt His tender mercy, who through life has been my guide?"

Now I know you may not see the direct connection between that job you are doing and your religion. But it is an interesting thing to me that Vince Lombardi never once went out even to practice his boys without stopping at his Catholic Church and getting on his knees, and then going out there to drill his men. There is a connection with what we believe and what we are, and what we do.

I am Chaplain of 2,000 Hoosiers who think they run this town. And one night a year they do. They go over to the Hilton Hotel and what happens to Chicago that night shouldn't happen.

We have a beautiful old poet who used to live. His name is James Whitcomb Riley. His philosophy for us good natured Hoosiers was in this:

"Oh, the world is a curious compound
With its honey and its gall
With its cares and bitter crosses,
But a good world, after all.

And a good God must have made it,
Leastwise that's what I say
When a hand is on my shoulder,
In a friendly sort of way."

This was the human philosophy of James Whitcomb Riley, but did you ever realize that this old poet who wrote "Aunt Marys" and all the rest of those simple country poems, wrote the most beautiful prayer that ever was used outside of the Bible, and it's called, "The Prayer Perfect." And that prayer is sung, and it says:

"Dear Lord, kind Lord, gracious Lord, I pray
Thou wilt look on all I love tenderly, today.
Weed their hearts of weariness
Scatter every care down a wake of angel wings
Winnowing the air.
And with all the sorrowing, O, release this day
Around them the good love, for all mankind
I pray."

What I am saying, gentlemen, is this. You men walk in the midst of confusion, crime, even, you men walk and carry loads that are uncarryable, and you see the most important thing you take into any one of those situations in yourself, a thinking brain, a believing heart, a skilled hand.

Problems solved with patience

I don't mean to preach a sermon to you fellows but I do mean to say this, we in our Bicentennial and you in Canada with the increase of every day, we all face each day problems that will be solved according to the problem solver. And there are things you can't settle because maybe the government settles them. But in most cases you are decisive. And you need to bring to it patience.

Somebody said, "Patience is idling your motor when you feel like blowing your top." You need to bring to it perspective.

I dedicated the London Bridge out at Lake Havasu City a few years ago. When introducing the man who bought the bridge for $3 million and then sold it for $3 million more dollars and then paid for it in one year, because the government wasn't interfering, Lorne Green introduced Mr. McCulloch, who had done this very interesting affair. He said, "I have always noticed about Mr.

McCulloch two things. He's so rich, he's sending Howard Hughes CARE packages." Well, I don't know whether he was or not. He said, "I've noticed this, when a man sees the invisible he achieves the impossible."

You have to be perspective. I have 31 murderers parolled to me and they get impatient. I sometimes say to these boys, "It takes long-range dreams to overcome short-range frustrations. You brought upon yourself double problems, so, lengthen your look."

And then we need to have persistence. I never saw Babe Ruth but once. I was very young and he was very famous. Everyone was excited because "Old Babe" had become the Home Run King of the world. And the newspapers were interviewing him and he chuckled happily to himself. He said, "Isn't it interesting?" He said, "I am the Home Run King of the world but," he said, "nobody ever asked me how many times I fanned out."

And one of the men said, "How many times have you fanned out, Babe?"

He said, "Well, in the bush leagues and in the big leagues, all together, I've knocked 851 home runs, and I've fanned out 1,339 times."

And the amazed man said, "What's the secret of your success?"

He said, "The secret of my success is this. It's the same as the secret of success anywhere else in the world. Just keep coming up to bat and keep swinging."

Now that's not very comforting but that is a principle of life.

May I close by this.

You're roadmasters, bridge builders, and I like that word "master." I think after making the widest cycle of insane permissiveness and colossal confusion that we've ever made in America in personal life, I think it is time to get back to the Masters. And I want to close with an illustration about one old, pretty well known, old-time Illinois citizen named Abe Lincoln.

When Abe was President of the United States he had more confusion, more hatred, more viciousness, with the newspapers writing everything they could think of. Things were so bad in the Civil War that one night a Republican committee waited on him all night to demand his resignation as President of the United States. Lincoln had a habit which all of us could learn about the confusion and problems of life. He had three things that he always did to hold himself up.

One was, he read, and the big book he read was the Bible.

The other was he prayed. Somebody has said, "Prayer is the golden river at whose brink some die of thirst and others kneel and drink."

Then, when he got up from reading and praying, he acted. And that night, all night long those angry politicians had waited downstairs to demand his resignation. And the next morning, Old Abe went down and faced those angry men, and said, "I am Master. Go back and tell the Senate that I am Master."

Well, gentlemen, in our daily problems, in the great struggle of building the greatest civilization man has ever known, in Canada and in the United States, where we have the greatest freedoms that have given us the finest abilities, the greatest attributes and the finest dreams of history, in these two great countries of ours, where our economic system has given us the finest products for the widest distribution, paying the highest wages and getting the most fantastic standard of living history has ever known, in this country where today with all our problems we have power enough that you and I are the best fed, the best housed, the best clothed and the best educated people of the world. In the United States, where even those who are on welfare are in the upper 4% of the income of the whole world, we need to be Masters again.

It's been good to be back with you. I wish you the best of luck solving your big problems. Remember this, you have problems, gentlemen, but the thing I have tried to say to you is this, you've got power—and you are the power. Thank you very much. (Applause)

President Williams: Thank you for sharing your inspirational thoughts with us, Dr. Winters.

I understand you have a speaking engagement in Denver tonight, so please fell free to leave whenever you wish.

I will now turn the podium back to President Dennis.

Introduction of Maj. Gen. K. T. Sawyer

President Dennis: Thank you, Jack.

Our next speaker is Director of the Northeast Corridor Project Office of the Federal Railway Administration.

This office was established to implement the one and three-quarter billion dollar passenger service improvement program scheduled for the road between Washington and Boston. The 5-year project is designed to upgrade tracks, rebuild bridges, modernize and extend the electrification and restore railroad stations in the corridor.

As Director of the office, our speaker will coordinate the rail rehabilitation program with Amtrak.

Prior to his FRA appointment our speaker, who retired from the Army in 1974, was a Senior Project Manager for the Ralph M. Parsons Company, an international engineering and construction firm of Pasadena, California.

His military career included the post of district engineer for Alaska, commander of the Port Construction Group in Qui Nhon, South Viet Nam.

He was administrator for a $1.5 million dollar federal, civil works and real estate and military construction programs in five Pacific northwest states.

A native of Menominee, Michigan, our next speaker attended the University of Michigan and received his Bachelor of Science from the U.S. Military Academy at West Point in 1943.

He earned a Master's Degree in Civil Engineering from the State University of Iowa in 1948.

He graduated from the Command and General Staff Collee in 1956, and U.S. Army War College in 1960.

In 1968 he was the recipient of the Wheeler Medal for Outstanding Engineer in the Corps.

Throughout his career, he also was awarded a career Medal of Merit, the Purple Heart, Silver Star, Bronze Star, Air Medal, Commendation Medal and the Distinguished Service Medal.

Now speaking on the subject, "Our Plans for Upgrading the Northeast Corridor," it is my very great pleasure to introduce Major General Kenneth Sawyer. (Applause)

Northeast Corridor Improvement Program

By KENNETH T. SAWYER

Director, Northeast Corridor Project

Kenneth T. Sawyer

Thank you. I don't know where you got all that, but it sounds familiar.

I. Introduction

Thank you for the opportunity to describe the Northeast Corridor Improvement Program and to discuss the arrangements being made to implement it. This view of the Corridor at Providence, R.I., indicates the scope of our task in making this route suitable for high-speed, electrified vehicles.

The 4-R Act, passed by the Congress in February 1976, made possible the first comprehensive railroad project undertaken in the United States in many years. Significantly, our work must be accomplished while Amtrak, commuter, and ConRail trains, about 100 per day in number, continue to operate.

II. Development

The Northeast Corridor Improvement Program is presently limited by law to the spine system which is illustrated on this strip map. The main-line route was the property of the Penn Central Transportation Company's passenger operations. Following conveyance to ConRail, Amtrak entered into an agreement to purchase the Corridor and has since assumed responsibility for its operation and maintenance. Our project specifically excepts such branches as Philadelphia to Harrisburg or Albany to New York, even though these routes are situated within the States covered by the Act.

Extent of project

The Corridor extends some 450 miles from Washington to Boston via the Hell Gate Bridge in New York City. Major intercity stops are: Baltimore; Washington; Philadelphia; Trenton; Newark; and New York—Penn Station. North of New York, stops are planned for Stamford; New Haven; New London; Providence and Boston's South Station. In addition, stops will be made at New Carrollton, Md.—also called Beltway; Metropark, South of Newark; and Station 128, South of Boston. It transits eight states having a population of 40 million people, 20% of our Nation's land area. This high population density of 1,000 people/square mile, and its linear distribution between the Nation's Capitol and the major educational complex at the Northeastern Terminal suggests a similarity to the situation of the new high-speed Japanese National Railroad between Tokyo and Hakata, as well as to high-speed rail service established in England.

In Japan, since completion of the Tokyo-Osaka Section for 120-mph train service in 1964, the number of trains per day has increased from 60 to 225 and the number of riders per year from 11 million to 110 million. This Section is wood tie on ballast. The new line from Osaka to Hakata is built on concrete for top train speeds of 150 mph.

For the Corridor, we project (we think conservatively) an increase in the number of intercity passengers from eight million in 1973 to 27 million per year in 1990. Studies have shown that the rail-improvement program is the most economical and environmentally acceptable solution to easing the problems of increasing congestion of the auto and air modes in the Corridor.

For example, the Federal Aviation Administration projects that traffic through the six major air terminals in the Corridor will increase from 45 million to 75 million passengers by 1985. The forecast at that time is for an excess in use over capacity of four million passengers at New York's three airports. To compete with auto and air for a larger share of this expanding market, and to relieve some of the anticipated congestion, our studies show that time is a primary factor and passenger fares are second in importance.

The Corridor Rail Improvement is on sound ground environmentally. The new land area required for Corridor railroad improvement totals 1350 acres. In contrast, this is the equivalent of only 19 miles of modern freeway. The new airport at Dallas-Ft. Worth occupies 18,000 acres. Perhaps of even greater importance is the fact that the electrified trains use an energy source free of dependence upon oil. We will, of course, have our share of short-term environmental problems during construction since we traverse an area of considerable historical importance which contains substantial wetlands and navigable rivers.

Fast train schedules

This slide identifies the major goals of the program authorized by the 1976 Act. We are to achieve by Feb. 1981 trip times of 2 hours 40 minutes between Washington and New York City, and 3 hours 40 minutes between New York City and Boston. These two goals tend to lock-in our design and construction schedules. In addition, total cost is limited to $1.75 billion in Federal funds.

Th Act authorizes the use of $150 million in Federal funding to match an equivalent amount in State funds to rebuild the non-operational portions of passenger stations. Thus, the total program is authorized for $1.9 billion. These funds will be used to tie-in our intercity improvements program with commuter rail service improvements funded jointly by Urban Mass Transit Administration and local entities or States.

The la wrequires that our program look to the future. Should the economic forecasts made in our studies be proved correct, the Congress may consider additional rail improvements. Such additional work **could** involve: upgrade of track, bridges, and electrification of branch lines; segregation of freight and passenger services; improved passenger vehicles; higher speeds; or more sophisticated control systems. We are obligated to report to the Congress on these matters at the end of two years and again after six years.

An additional objective is to ease the high levels of unemployment which exist throughout the Region. Further, we intend to insure that small and minority businesses participate in the engineering, design, construction, and procurement phases of our program.

The Program has been subdivided into nine subprograms. The first four categories relate to track and bridge and equate to almost one half of the total program cost. Probably at least one-half of this cost would be for material. The other major components of cost are: Electrification and signalling; maintenance shops; and, stations. All matching funds will be used in the station category. The preliminary cost estimated for each element is reflected on the slide. A first task of the architect-engineer firm we are presently hiring as our Program Manager will be to develop a final total system program with schedules and costs for each project. In preliminary planning, we have identified a total of about 400 projects within the total scope of work.

To obligate $1.9 billion

Our funding program lines up as shown on this slide. We expect to obligate the $1.9 billion by October 1980. Through the end of Feb. 1977 we expect to obligate the first $200 million as follows:

$90 M on Engineering and Design

$70 M on Long-lead Procurement, and only

$40 M on Construction, primarily track improvement.

It can be seen that the substantial allocations of funds are keyed to the tentative program schedule which I will illustrate on the next slide.

We are presently negotiating with the Joint Venture of DeLeuw, Cather/Parsons Associates to provide engineering, design, construction, and procurement **Management** services.

This slide indicates that our systems engineering planning will peak in Feb. 77. With funding provided by the 1973, **3R** Act, engineering through concept level has been nearly completed. We have, for example, preliminary performance standards for all passenger stations. Each of the bridges has been studied and preliminary concepts developed for repair, strengthening, or replacement. Track charts are complete for the entire route. Grade crossing alternatives have been examined. The remaining major engineering tasks are the final development of a program master schedule and system performance specifications. While we intend to push the state-of-the-art, the **Schedule** requires that we limit our engineering concepts to existing technology.

As you see, most detailed design will be completed in early Feb. 78.

Construction will commence in earnest in Feb. 78 as design is completed. We intend to work from multiple locations in Washington, Philadelphia, New York City, New Haven, and Boston to assure completion of construction in 40 months.

On this slide, the nine subprograms are displayed in the left column and their costs, totalling $1.9 billion are shown in the right-hand column. The work is then broken down by States. The largest amounts will be spent in Connecticut and Maryland where substantial segments of the route are located.

The Program will have only a slight impact on the labor market during Feb. 76; however, our plan shows a significant manpower requirement commencing in Feb. 77 which peaks at the 15,000 level in Feb. 79. All eight states will benefit substantially from the project. We plan to work through Amtrak to develop an appropriate individual training program both for the period of construction as well as for subsequent operations and maintenance.

The Secretary has delegated to the Administrator, FRA, responsibility for implementing the Program. Mr. Hall has organized the Northeast Corridor Project Office, dedicated solely to this Program. We have reached an agreement with the Federal Highway Administration to provide about 35 engineers for our staff. Additional engineers, in disciplines not usually found within the Department of Transportation, are being hired by contract to augment our staff. We plan to avoid build-up of a large engineering/construction staff in either FRA or Amtrak.

We expect to have our Architect-Engineer under contract in late September. It appears that DCP will be successful. It is planned that they subcontract most detailed design using standard Federal procurement practices.

Amtrak has large role

A contract with Amtrak has been signed which casts Amtrak in a dual role. As systems operator and maintainer, Amtrak will participate in program and project development and in construction oversight, testing, and acceptance. As systems operator, Amtrak will manage all construction which would disrupt train service or which requires close coordination with operations for reasons of safety. This work would include track improvemennt, some bridges, fencing, electrification, signalling, and stations.

Other work will be contracted by the Northeast Corridor Project Office with construction contractors.

A significant portion of the improvement program is aimed simply at eliminating the backlogs of deferred maintenance. This backlog has contributed to the deterioration of reliable service.

We must improve about 1,300 miles of track. Cleaning ballast is needed on 900 miles. We will replace ties and install continuously welded rail on 420 miles. Subgrade must be stabilized in certain areas. Brushing and drainage work will be accomplished on 125 miles. Alignment and surfacing is necessary on more than 800 miles.

Some 770 of the 855 bridges on the Corridor must be repaired, strengthened, or replaced. One-hundred ninety bridges were constructed prior to 1895, and 80% of these must be replaced. One half were built between 1895 and 1920 and must be strengthened. Nearly all bridges require some rehabilitation. Since the route crosses a number of important navigable rivers we must upgrade some substantial lift-span bridges. Interestingly, many of the present wetlands were created when the railroad embankments were built. Today we must exercise great care to avoid impacting adversely on these wetlands.

Four badly neglected tunnels must be reworked at Baltimore and New York City to increase clearance for 25 KV electrification and to install new concrete roadbed.

Major work at 15 stations

We will upgrade 15 principal passenger stations to provide sound structures, platforms, canopies, escalators, air-conditioning, and utilities and adequate parking and access. everal of the stations as Union Station, D.C., shown on this slide are national landmarks. Other stations, such as Newark, are well-built structures requiring extensive rehabilitation.

A few, such as this station at Now London are quite small.

Three stations—basically commuter stops—as this one at Metropark in New Jersey will be built from scratch.

The concept for these new designs is shown on the slide. The concourse is at track level; access for passengers from below; with high-rise parking facilities and elevated pedestrian bridges leading to the concourse. These designs may prove to be useful for similar stations elsewhere.

Perhaps I can best illustrate the character of the track and bridge aspects of our program by showing some additional slides.

- Poor drainage in New York
- Vegetation in the tracks between New Haven and Boston
- Poor switch timber conditions and equally poor tie conditions
- Frog condition, New Haven
- Rail condition in New York
- Rail joint condition near Boston
- Poor surface condition

On the many bridges, we can anticipate the usual problems.

- Abutment conditions vary from good to very poor. If we make major changes, the Coast Guard may require us to elevate certain bridges to provide for improved clearance standards. Such action could materially impact on costs.
- This shot of a floor beam is not untypical. We have some which are held up by rust.
- Main girders have been damaged on many thru girder bridges.
- This view of the bridge at New London will demonstrate that all of our problems are not small ones.

A second major component of the improvement program addresses maintenance facilities. We propose to build 13 new maintenance-of-way stations along the route and a central facility for maintenance of MW equipment. For vehicle maintenance, we will construct a new heavy shop and cleaning facility in Washington at the site shown here. A running-repair and cleaning facility will be built in Philadelphia. Medium shops and car-cleaning facilities are to be constructed in Boston.

A third element of the improvement program is calculated to have a substantial impact on train operating efficiency and safety.

We will accomplish selective upgrading of the signal and communications system along the Corridor, and installation of centralized traffic control systems between Philadelphia and New York (150 miles) and between New Haven and Boston (110 miles). Additional signalling will be installed between Washington, D.C. and Philadelphia.

Existing track circuits must be modified for 60-cycle propulsion power from Washington all the way to New Rochelle, New York.

There are some 66 private grade crossings to be eliminated under the program. Federal Highway Administration has programmed removal of all public grade crossings.

Security fencing is to be erected throughout the Corridor.

The fourth and final component of the program deals with achieving significant economic and operational advantages. For example, we plan to increase power from 11.5 KV to 25 KV, cutting in two the number of substations required.

The electrification improvement effort will require the reconstruction of 23 substations from Washington to New Rochelle as well as selective rehabilitation of poorly maintained catenary.

We will extend existing electrification from New Haven to Boston, eliminating an engine change, and extending the use of electric locomotives with their improved acceleration. This effort requires 310 miles of new catenary and cab-signal equipment, plus increased clearances on 62 bridges, and ten new substations. With this improvement, the route is freed of dependence on petroleum fueled-power, and will operate at considerably less cost for energy than is achievable on the present 11.5 KV - 25 Hz system.

We will consider major realignments of 24 curves in the South Corridor and 33 in the Northeast area. Incorporation of major realignments in the program will depend upon the extent to which modeling indicates that construction will reduce trip times and improve safety.

Trains have already traveled in service on certain parts of the existing alignment at speeds greater than 120 mph. When you hear reports of trains moving at speeds of about 150 mph in years past, it was usually on the test track section built in New Jersey. Nonetheless, we will make a number of minor realignments, change superelevations, and increase spiral lengths compatible with our top speed objective.

In addition to the facilities and utilities work which I have described, we will do development work on vehicles, electrification, and track at the Peublo Test Center. I want to highlight several points. A major factor in all of our development planning is the controlling goal to provide specified trip times by February 1981.

Twenty-six of these E60 locomotives were purchased as 120 mph vehicles for the Amfleet cars. Amtrak has more than 500 of these cars. Service tests have revealed that these locomotives may not be safe or reliable at speeds in excess of 100 mph. In addition, their acceleration characteristics are significantly less than those necessary for 150-mph top speed. They have a high axle load and unsprung strength which will cause high track-maintenance costs at 120 mph service levels.

Amtrak currently has 50 Metroliner units which were designed to meet a 150-mph top speed specification. These vehicles have been service tested at 120 mph. Although this fleet is aging and the units will require major modifications, this vehicle is the only bird-in-hand with which we can meet trip-time goals within the program time frame. We have therefore recommended to Amtrak that they initiate upgrading of this fleet; however, the extent of this upgrading could be constrained by yet another current development.

Amtrak has brought a Swedish locomotive to Pueblo for testing. If successful, it would be used with Amfleet cars.

An additional alternative is a French locomotive which is to arrive in Pueblo at year end for testing. The results of all this testing both at Pueblo, and in service, will provide hard data needed for preparation of our six-year report to the Congress recommending actions to be taken in future years by that body.

This view is of a French design turbo train now in service in the Chicago area. This vehicle can be constructed in the United States. Similar arrangements would be necessary if either the Swedish or the French designed locomotives were adopted for use in the Corridor.

We are planning concrete ties and concrete pads for switches in the FAST facilities at Pueblo. In one year we can collect data equal to about ten years of service testing. About 14 miles of concrete ties will be placed in the mainline in New Jersey also. We plan to use hardwood ties in the early phases of our track program; however, we want to be able to consider the concrete alternative in certain specific applications and to get better data on its economics. We want also to consider concrete pads in discrete locations—for example, for switches, in tunnels, or on bridges.

III. Summary

My remarks have been calculated to provide an overview of the Northeast Corridor Improvement Program. We understand fully that we have our work cut out for us. With the help of Amtrak, our project managers, the labor unions, construction contractors, and the many Federal, State, and local officials and agencies, and citizens concerned with what we will be doing, we are now prepared to get on with the job.

President Dennis: Thank you very much, General Sawyer, for that informative and interesting discussion. We thank you for taking the time to be with us.

I will now call on Mr. Parker, Program Chairman, to present our next speaker.

Mr. Parker: With 1976 being the Bicentennial year, the 200th Birthday of the United States of America, and the contribution that the members and the people they represent, the Roadmasters & Maintenance of Way Association of America and the Railway Bridge and Building Association, wish to mark the development and growth of our country.

Introduction of H. T. Remley

With this theme in mind, we have selected our next speaker. He was born in West Palm Beach, Florida. He was raised in Jacksonville and attended the schools in that area.

He served in the U. S. Navy in World War II in the Pacific theatre.

He is associated with the Seaboard Coast Line Public Relations Department as supervisor of service affairs.

He began his railroad career in the Freight Traffic Department and served in that Department and the Industrial Development Department throughout the southeastern United States.

He spends considerable time speaking to civic groups and to our youth throughout the country.

He received the Service To Mankind Award in 1971 from the Northeast Florida District Sertoma International, as well as the West Jacksonville Sertoma Club.

He was the 1972 recipient of the National D.A.R. Medal of Honor for Outstanding Achievement in promoting true patriotism and Americanism. This was the first award of its kind presented in the Southeastern Region by the Daughters of the American Revolution.

He received the 1971-72 Award on Americanism by the Veterans of Foreign Wars at their convention for outstanding service in Americanism.

In 1973 he was the recipient of the Outstanding American Award by the Florida Jaycees at their convention.

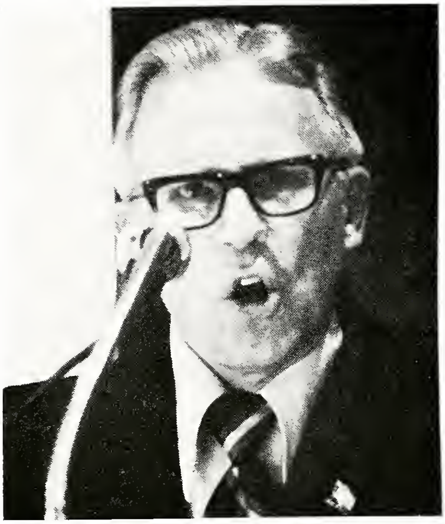
In 1974-75 he was awarded the Americanism Medal by the American Legion Auxiliary for Outstanding Service in Americanism.

It is my pleasure to present to you at this time, Mr. Harris T. Remley, supervisor, civic affairs, Seaboard Coast Line, Jacksonville, Fla.

Freedom Is Everybody's Business

By HARRIS T. REMLEY

Supervisor Civic Affairs, Seaboard Coast Line



Harris T. Remley

Thank you very much, Ace, for that nice introduction.

Mr. President, platform guests, and gentlemen. I'm honored to be here today.

It's been a great time for me so far. I've been so busy the last three weeks I had to pay a man to do my brokering for me.

You know, talking to so many different groups and high schools, a lot of people in the audience don't believe I work for the railroads. I never talk about railroads. I talk about America. And when you talk about America, in effect you are talking about railroads because they built America.

I usually take a train whistle with me to a convention when I'm speaking about free enterprise. A retired railroad man in Memphis makes these aluminum whistles and I bought one of these things. I never realized how much fun I would have with it. I also discovered it serves as a useful purpose. When I'm speaking and someone drops off to sleep, I just blow it. It's very effective when I'm speaking to high schools and some of the kids in the back row are more interested in holding hands than paying attention.

The last thing my son said before I left, and he's a railroad bug from the word "go," he said, "Daddy, when you see all those railroad men up there and all those railroad representatives, tell them I collect railroad patches. I want to get enough for my jacket." So, if any of you have a patch, if you would drop it in the mail to me, I would appreciate it. If you'd all go home and do it immediately, I know he would appreciate it.

It's a great system and a great country and a great transportation industry.

They used to tell the story that when Al Smith was Governor of New York many years ago, he had an occasion to visit Sing-Sing Prison for the first time. After he had been given a tour of the place, he was ushered into the auditorium and asked if he would say a few words to the inmates. And, first, Governor Smith said, "My fellow citizens." Then he realized they weren't citizens at all, that they were prisoners. So he corrected himself and said, "My fellow convicts." Somehow, that didn't get the response he had hoped for and in desperation, he said, "Well, anyhow, I'm glad to see so many of you here."

I had a friend who was interviewed on television. He was asked, "What do you think of the world situation today? Could you sum it up in just a few words?"

He said, "Yes, I believe I can. It's a land of crooked deals, unpaid bills, and you can't tell the Jacks from the Jills."

I suspect that just about covered it.

You know, with all the problems we're having in this country, I still have people come up to me and say, "We have a lot of problems in this country, but have you ever had it so good?"

Old Joe wasn't feeling good. He went to the doctor, and the doctor said, "Joe, you're in bad shape. If you don't go to Arizona immediately, you'll die." He went to Arizona and three weeks later they shipped Old Joe's body back home. A friend looked at Joe in his open casket and said, "My, that three weeks in Arizona sure did Old Joe a lot of good."

As I look over the last 200 years, we have had a great and glorious history, and today we are living in the most exciting times of the whole 200 years.

We sold the Russians our wheat and the price doubled. Then we sold our soybeans, and the price doubled. I have a suggestion—why don't we sell them some stocks?

I get upset sometimes about gas prices. I stopped in a gas station the other day and asked the operator if I could get a dollar's worth of gas and he sprayed a little behind my ear. So there must be something to this energy shortage.

I'm told business is so bad the Mafia has already laid off nine judges.

New York's ball team is in third place and the City is in the cellar. I guess if we inherit the earth, my luck would be to get a part of New York City.

Her desire to move is so great, mamma always wraps papa's lunch in a road map.

Representative Griffith said, "If food prices keep going higher, we'll have 60 million Americans eligible for food stamps.

If George Washington was alive today, he'd probably drop dead.

I heard the Russians have just sent up the largest satellite in our space race. They just sent up 12 head of cattle. And they are now boasting that this is the first heard (herd) shot around the world.

The government reports indicate the Russians are now catching up on us on submarines, missiles, and other weapons. You see, they haven't had to spend half their time fighting communism.

Elections are fascinating. I love election years. Of course, during election years the politicians are going to please everybody. A preacher said, "I'm guilty of many sins of omission and commission. I doubt there is a person in this whole congregation who thinks they are perfect."

About that time, a little man stood up in the back of the church. The preacher said, "You mean to stand up back there and tell me you're perfect?"

He said, "No, Reverend—I'm just standing in lieu of my wife's first husband."

Of course, during an election year you are always subject to hearing a lot of double-talk and you wonder whether what they say is what they mean.

They use notices to make things easier. The notice read: "Please notice an important notice about notices. You may have noticed an increasing amount of notices to notice. We notice some notices have been noticed, but on the other hand, some notices have not been noticed and this is very noticeable." It was signed, "Notice Committee on Notices."

The Lord's Prayer consists of 56 words, Lincoln Gettysburg's Address consisted of 266 words. The Ten Commandments consists of 97 words, the Declaration of Independence consists of 300 words, but a recent government order concerning the price of cabbages consisted of 26,911 words. Sometimes we do get a lot of double-talk, don't we.

I have been told that most of the money made in private enterprise is made in selling. That person who knows how to sell a good product or perform a good service is still in demand.

You heard about the salesman who was absolutely fantastic. He called on a prospective customer and made his full sales presentation. When he had finished, the listener said, "I don't like your service. I don't like your product.

I don't like your company. And, frankly, I don't like you. Get out!"

The salesman picked up his briefcase, and then he paused a minute, and he said, "You know something, I wish I had 100 customers just like you."

The man was absolutely dumbfounded. He said, "Friend, what do you mean you wish you had 100 customers just like me?"

He said, "Hell! I have a thousand of them."

Of course, the politicians keep on improving our economics. It's gotten so a great man can't even find a humble beginning. The typical American in 1976 has been described as the fellow who buys a German car in a Danish market from an Italian salesman.

He writes his Congressman demanding that he do something about the gold leaving our country. It's like the teacher who said, "Tommy, what is the principal export of the United States?"

He said, "Money." And he wasn't kidding.

It's like the man who wrote on the bottom of his income tax report: "Dear Sir: I understand the President is going to declare war on poverty. would you please tell me where I can go to surrender?"

One man said, "I don't want to improve my lot in life—I can't afford it."

I found out what they do in government bureaus. That's where they keep the taxpayer's shirt.

A business man said he was looking forward to the day when his son could share in his business, but the government beat him to it.

George Washington is the only President who didn't have to blame the previous administration for his problems.

We will always have political parties in America so they can use each other for an alibi.

I've been told that some politicians are like cockroaches—it ain't what they steal and carry home, it's what they fall into and mess up.

There is a vast difference between a political race and a regular horse race. In a regular horse race the entire horse runs.

Of course, politics are kind of hard to predict. I remember when Mao Tse Tung first ran for office. They said he didn't have a Chinaman's chance.

Now there's nothing wrong with a political joke as long as he doesn't get elected.

It's like the little girl who asked her mamma one afternoon, she said, "Mamma, do all fairy tales begin with, 'Once upon a time?' "

She said, "No, honey. Sometimes they begin with, 'if I'm elected.' "

I don't know whether your paper in your home town has been doing it or not but for the last three years our Jacksonville paper on the front page every day has Will Rogers. And it's almost unbelievable the things Will Rogers was saying in the '20's and '30's that are so apropos today. The guy who edits this column is just simply great, and it's just as though Will Rogers said it yesterday.

Somebody may remember old Will Rogers, who made us laugh and forget some of our problems in our country during some pretty rough times.

You know, Will Rogers said one time, "I'm not a member of any organized party, I'm a Democrat."

And the Republican Party Chairman asked his party leaders what they thought the Republicans needed most. And a fellow jumped up and said, "We need to multiply."

I'm told the Democrats have a good chance this year but they will probably spoil it by nominating somebody.

Somebody asked me the other day at Disney World why didn't I run for Congress. I said, "I'm not that crazy about women."

Will Rogers said, "I could study all my life and not think up one-half as many funny things as they can think of in one session of Congress."

Will Rogers said, "I don't make jokes. I just watch the government report the facts."

Will Rogers said of Congress, "Every

time they make a joke, its a law—and every time they make a law it's a joke."

He also said the income tax has made more liars out of the American people than golf has."

Well, we like to kid these fellows but most of them, I think, are trying to do a good job.

You know, it's an interesting thing that as you travel across the country you find that most Americans, I think, are concerned about crime as much as anything else. It's gotten terrible.

I heard of a case the other day where a man held up a bank in broad daylight in the morning. He told the cashier to "Put all that money in this bag." The cashier looked at him and said, "Here! Take the books, too—I'm $5,000 short."

One bank teller had been robbed five times and the FBI man said, "Well, honey, did you notice anything unusual about the thief?"

She said, "I sure did. Every time he comes in he has on a better looking suit."

Well, I tell you, let's look on the bright side, like the wife who said, "It's a good thing I spent Joe's bonus in advance this year because he didn't get one."

Optimistic about future

You know, I've learned one thing in traveling across this country. We have some wonderful, wonderful people in America. I don't care if I'm in New York or Minneapolis or Dallas, or Houston, or Miami, or Birmingham, Alabama, or anywhere else, there's one thing I've learned—the overwhelming majority of the people in this country are decent, hardworking, patriotic Americans and they love their country, their God and their families, and they are paying their taxes. That's the reason I'm optimistic about the future of our great country.

However, it is depressing to go home in the afternoon and turn on the television news. We're all anxious to hear the news and learn what happened that day. And how in the world these commentators in NBC and ABC and CBS can sit there five and six nights a week for 30 minutes and keep telling me night after night what's wrong with America, about all our problems and how corrupt our system is? I'm getting tired of it, because there are more good things happening in America every day than there are bad. So, don't let them get you down, fellows.

There is one newspaper man in San Francisco who became concerned over this. That's Mr. Charlie Gould, the Publisher of the San Francisco Examiner. Mr. Gould wrote an editorial. And in preparation for this editorial he went back over a two-year period to get a few facts and figures together. And he discovered and put in his editorial that during that two-year period more than 196 million people in America were not arrested. And he found out that more than 89 million married people in our country did not file for divorce. And he found out that more than 49 million students did not riot or try to take over some university.

More than 9 million young men in America did not burn their draft cards.

More than 75 million citizens and corporations paid $160 billion in income taxes.

More than 115 million Americans are affiliated in some way with religious groups.

He concluded by saying that while America may not be perfect, we're still the most compassionate and unselfish people on the face of this earth. We've given so much and we've asked for so little in return.

Whenever I speak of Americansim, patriotism, free enterprise, I always think of this great country of Canada that we've been talking about this morning because we're all on the North American Continent together. We don't have to go through security guards, stop and hearch, but we more or less have open access between our two countries. And this is great. And their system and our system still offers the greatest hope for the future of mankind.

Need spiritual energy

The energy crisis is another subject that you've heard about and one that you will be hearing about. But I'm convinced today, friends, if America has an energy crisis today, it's not so much energy that we need to run our factories and propel our vehicles and light our streets and warm and cool our homes and offices, but I personally believe that what America needs in 1976 more than anything is an old-fashioned dose of spiritual energy.

This is the kind of energy we're short on and have been for 30 years. Most of the problems in America are attributable to the fact, I believe, that somewhere in that time we decided, "Man! We don't need God any more. We've got everything going our way." Well, the truth is, God doesn't need the United States but we couldn't make it without Him.

When our forefathers came to this country, in case we've forgotten it, they had a Bible in one hand and a rifle in the other. They fought and they prayed and they carved out of a wilderness a great nation. They based our nation on a belief in God and that's the only reason America is the greatest nation in the world.

The reason America is the compassionate nation she is, and that's the reason when America defeats her enemies in times of war, she is the first to go in with food and clothing and medical aid, and more often than not we go in and help them rebuild their country.

Yes, God has blessed America. You'll find the handiwork of God all through the fabric of this great Republic, since the inception of our Republic. In all of our documents, our state papers, in the money that we circulate, and in the songs and music that we sing about our great country. Yes, God has blessed America. And I believe if America ever falls, it will fall from within. I'm not worried about them dropping a bomb on America.

Yes, I believe in God and I do love America. And the National Anthem gives me a thrill every time I hear it, friends, sung by a 5th grade class and played by the Marine Band in Washington.

I supported our men in Viet Nam, just like I've always supported our people when they were fighting and defending freedom anywhere in this world. And I don't care at what time or under what circumstances. I'm not responsible for the guilt of all society and I don't believe this world owes me a living.

I have confidence in our younger generation. My favorite colors are red, white and blue. And I want you to know that today, ladies and gentlemen, we live in the greatest country the world has ever known—and don't you ever let anyone tell you any different.

Waiting line of immigrants

We're not perfect yet. But this is the only country I know of in the world that has a waiting list out there, of not only thousands, but millions, who would do anything, and I mean anything, just to get here.

Very frankly, the way some people in this nation have abused their citizenship over the last 15 or 20 years, I wish I could swap them for some of those immigrants, who would love to come to America and make a contribution to the cause of freedom.

Andrew Jackson said that providence had showered on this land lessons without number and he has chosen you to be the guardians of freedom, to protect it and preserve it for the benefit of the human race.

That's not only an inspiration—that's a challenge. That's an obligation.

Yes, America is an ideal, a hope and an aspiration, where you can still pursue your own destiny in life, where you can still elect those who govern your country. And when there is something you don't like you can stand up and voice your opinion for it or against it. Just a little simple freedom.

I've had the great privilege of being on a number of convention programs with some of our P.O.W.'s, including one of my former classmates. I've come to love, respect and admire these men who paid a terrible price for the cause of freedom. But the unique thing about most of them was a simple statement, it was their faith in God, their country, and their family that sustained them during those long years. They have been an inspiration to the American people, as well as all those who served their country.

Yes, I'm even more than doubly proud of our Red, White and Blue locomotive, the Spirit of '76, which has been an inspiration to millions across the country.

The largest American flag

Many of you have seen pictures of our General Office Building lit up like the Flag on the Fourth of July, the largest American Flag, to my knowledge, displayed anywhere in the United States. People come from miles around to view it.

I'm glad I work for a company that not only believes in our American way of life, but gives me the opportunity to travel over the country and speak in schools and conventions and other organizations carrying this message.

When I look at the American Flag, I'm reminded of the words of William McKinley, who said on one occasion, "We all love that Flag. It gladdens the hearts of the old and the young." It doesn't make any difference where you raise that Flag, whether it's on land or sea, here at home or out there in some distant possession, it always stands for liberty and humanity. But when that Flag is assaulted the whole nation rises to defend it.

Benjamin Harrison, our 23rd President, suggested the National Flag shall float over every school house in America and the exercises in those schools be such it will impress upon our youth the patriotic duties of American citizenship.

Many of these great heroes of the past, my friends, are collecting dust on bookshelves somewhere today. We don't hear about these great heroes who inspired men and women in the cause of liberty. Too often they are silent.

It was Benjamin Franklin who said, "Liberty will not descend on some people. The people must raise themselves to liberty."

Old Daniel Webster said, "God grants liberty only to those who love it, and those who are willing to guard and defend it," and that's what America has been doing in my lifetime, is guarding and defending freedom somewhere in this world.

I have never known anybody who liked war. The greatest military men in the history of our country have been the strongest advocates of peace. But, you see, I'm old enough to remember that maniac Adolf Hitler, who said he wanted peace. He wanted a piece of that, and a piece of this, and a piece of the other—he wanted all the pieces. That's the reason America has to remain strong, not only militarily but morally and spiritually.

Advocates a strong military

Don't you let them cut your defense budget.

I was addressing the National Defense Transportation Association in Columbia, South Carolina, a couple of years ago with Strom Thurman and Floyd Spence. I heard Floyd Spence close his talk one evening by saying simply this:

"These people who want to take money out of our defense budget and funnel it into the domestic and welfare programs are making a mistake. Because," he said, "if America does not have a strong national defense, you won't have to worry about the welfare or domestic programs because the communists will be taking care of you."

Gentlemen, it's just that plain and simple. These great patriots, who left us a legacy and a heritage, of which we are greatly proud, like Captain John Park at the Battle of Lexington, who told his men, "If they want war, let it begin here."

General Putnam at Bunker Hill on a hot June day in 1775 told his men not to fire "until you see the whites of their eyes."

The young school teacher, Nathan Hale, who wasn't quite 22 years old, about to be executed by the British for gathering information behind enemy lines, when they asked him if he had any last words, very proudly said he regretted he had but one life to give for his country.

John Paul Jones, the "father" of the American Navy, when they asked him to surrender, said, "I've not yet begun to fight."

Captain James Lawenhe in 1813 told his men, "Don't give up the ship."

Admiral Perry sent word, "We've met the enemy and they are ours."

Or Admiral Farragut who said, "Damn the torpedoes. Full speed ahead."

General McAuliff's Division was cut off by the Nazis in World War II and the German Command kept asking him to surrender. And each time the General's reply was very brief—"Nuts."

The Alamo. Oh, what a historic record we have, gentlemen, in the cause of freedom. John Kennedy's oft quoted statement, "Ask not what your country can do for you. What can you do for your country?" And it's still a good statement today.

Too many Americans don't remember something else President Kennedy told some Cubans in Miami in 1962, when he said, "The cost of freedom is always high." But Americans have always paid it. And one path we'll never choose is the path of surrender or submission.

When I read that statement my mind reflected back to the Korean War, when one day the soldier said his Commander stood up and said, "The enemy has us completely surrounded. We must not let them escape."

Deplores apathy and indifference

Gentlemen, that's the same kind of patriotism and dedication we need in America today. Our biggest enemy is apathy and indifference and people who just don't care.

Like the cartoon in the Wall Street Journal. These two fellows are sitting there having a drink. One of them said, "If our government doesn't get down to brass tacks pretty soon, I'm going to start voting."

We just had an election in Jacksonville and 27.5% of the total vote is all who voted. In the Presidential election in 1968, 48 million Americans didn't vote. And in 1972, it was almost 60 million who didn't vote. And the U. S. News & World Report is now predicting that more than 68 million won't vote this year.

My words to those people would be the same thing that Gomer Pyle would probably say—"Shame — Shame — Shame."

I stood in Miami Beach a few years ago after Castro and his communists took over Cuba and talked to a young Cuban who had just lost his country, his home, his business, his freedom, and two members of his family. And as we talked, the tears ran down his cheeks. He said, "Mister, if I could just vote for freedom just one time, I'd get on my hands and knees and crawl 20 miles to that ballot box, because I've lost it in my country. But," he said, "if my country is ever free again, I'm going to know who's running, I'm going to know what they stand for, and I'm going to get involved. I was just too busy doing other things."

I talked to a Cuban Doctor who had left a beautiful home and a good medical practice. A handsome bank account, two cars in the garage, a swimming pool and all the material blessings he had earned. But he and his wife didn't have time to pack a suitcase. In fact, he couldn't bring his watch or ring with him, nothing of any value. When he arrived in Miami he had just the clothes on his back. He had to start all over again. He met the press and he said, "We were so fortunate because we could come to America."

Several years ago I was down in Florida addressing a watermelon convention. The next morning at breakfast I had an elderly man come in and sit down at the table next to me. He was 86 years old. He looked at me, and he said, "Son," and I appreciated that, too, he said, 'I was one of those immigrants you were talking about last night. But I just want you to know I came from Russia in 1928 and landed in New York City. It only seems like yesterday when I stepped off that boat. And the first thing I did when I touched the ground was to take a deep breath of free air.

"The second thing I did was to look at this beautiful, this magnificent country. I was so thankful just to be here. But," he said, "you know, son, I didn't have but two $1.00 bills to my name. I couldn't speak English. And I have folks telling me today they have handicaps. I tell them I would hate to wind up in Russia tomorrow with two rubles in my pocket and couldn't speak Russian."

This guy is a millionaire. But he didn't ask somebody where the welfare office was and the food stamp program. He came to America looking for freedom and opportunity.

Despite what you read in the papers today there are more opportunities in America than we have people. Every newspaper is full of jobs. The problem is that people don't want to work any more. They've found out they can get paid for not working. I've got news for you. I don't believe in paying anybody for not working any more than I believe in paying anybody for not producing.

The heart of free enterprise

Production is the magic word. Production is the heart of free enterprise. Production is the reason we're meeting in this hotel. Production is why you have an airplane in which to fly home, an automobile to drive, a television set to watch. Without production you have nothing.

Some of these kids coming out of college today, they don't want to start at the bottom and work up. Man, that takes years. They want to become vice president immediately.

One kid applied for a job, and when he stated what salary he expected, the man said, "That's a big salary you're asking to start." He said, "Yes, the job's a whole lot harder when you don't know nothing about it."

As I told you, I go to a lot of schools. And I love kids. There's nothing wrong with the schools—it's just the principle of the thing.

I went into a high school. The principal was talking to a boy in the back of the room. He said, "Son, I'll teach you not to kiss the girls in this school." The boy said, "I've already learned."

But, you know, I would rather talk to the third, fourth, fifth, and sixth grades. I ask them to write an essav on "Why I Love America." I wish I had time to share some of those essays with you. You know, kids say the cutest things. The little boy said to his daddy, when he saw him dressed up in his tuxedo, "Daddy, please don't wear that suit tonight. You know every time you wear that suit you have the worst headaches the next day."

Another boy told his dad he was invited to a meeting to his school that night. His dad said, "I'm not going. I don't like meetings." The boy said, "Dad, you'd better go. It's going to be you, me and the principal."

Another little boy went to New York City with his dad and the boy wanted to see the Empire State Building. So they got in the elevator, his dad pushed the button and the elevator went flying up to the 70th floor, and the little boy said, "Daddy, do you think God knows we're coming?"

One little kid was sitting in the algebra class and he couldn't work the problem. The teacher said, "James, you ought to be ashamed of yourself. Do you realize when George Washington was your age he was a surveyor?" The kid said, "Yes, and when he was your age he was President of the United States.

A workman hurt his leg on the job and he was home recuperating. The supervisor came around to his home, knocked on the door and the little 9-year old answered the bell. The supervisor said, "How's your daddy today?"

He said, "All right, I guess."

He said, "When is he coming back to work?"

The kid said, "It will probably be a long time. I don't know." He said, "Something called convalescent compensation has set in."

A lady came into a grocery store one morning with her hair all done up in those king size curling rolls, like you've seen. When she walked in, the clerk's eyes popped out and he followed her all over that store. Finally, he couldn't stand it any more and he said, "Lady, how many stations can you get on that thing?"

But, I tell you, these kids are something else and they are worth every minute we spend with them to try to encourage them. It's like the little boy who came in after school one day. His daddy was reading the newspaper. Somehow they had printed a map of the world in one section of the paper. His father took a pair of scissors and cut out all the little countries of the world. He gave the little pieces to his son and said, "I want you to go into the other room and put the world back together."

The kid scampered out of the room and in ten minutes he was back again. He said, "Daddy, I put the world back together."

His dad said, "Son, that's impossible. How did you do it so quickly?"

The kid said, "Daddy, I just turned those pieces of paper over and on the back was a picture of a man, and I put the man back together and the world was right." Here was a kid in elementary school who had just about solved one of the problems the United Nations can't solve after spending billions of dollars.

Gentlemen, this is a magnificent system. I don't want you to leave here today with any doubts about this great private enterprise system. It's not the system that's at fault. It's what these bureaucrats with their regulations, interferences, and handicaps have done. I am convinced if the federal government would get off the back of private industry and let the industry operate on a free, open and competitive market we would be out of this recession in six months and everyone would be working because private enterprise would wipe out more poverty in six months than Washington can do in a hundred years at half to cost.

Let's assume someone wanted to compare our country with the Soviet Union. The first thing they would do is abandon three-fifths of the steam capacity of this country. They would abandon two-thirds of the hydro-electric plants. They would eliminate 95% of the electric output. They would rip up 14out of every 15 miles of railroads. They would sink eight of every nine ocean-going ships. They would junk 19 of every 20 cars and trucks.

You see, what bothers the Russians, they have all the parking places but we have all the automobiles and the highest standard of living.

They would send 60 million Americans back to the farms. The kids wouldn't be worrying about where to go to college—they would be sent back to the farm. It is all predetermined by the government.

They would destroy 40 million television sets. They would eliminate nine out of ten telephones.

Accomplishments of America

Let me tell you how great it is to be an American. We have 6% of the population and occupy 7% of the surface of the world, yet we have 71% of the automobiles, 56% of all the telephones, 56% of all the radios and television sets in the world, 90% of all the bath tubs in the world—and it's a shame more of them are not being used.

Two guys were going up in an elevator. One of them said, "Your deodorant isn't working." The other one said, "It must be you—I don't use it."

This country produces 59% of the world's steel and 56% of the world's electric power and 50% of the oil; 56% of the corn and 42% of the cotton; 33% of the coal; 31% of the copper; and 38% of the iron; and 44% of all the manufactured goods you see in this world are produced by this 6%.

We've got some Marxist professors in some of our universities in America who don't even believe in free enterprise. They're telling our kids that the free enterprise systm is out of date. "Socialism is the new day." Don't you believe it. Don't you believe it.

In Russia it takes 39 million farmers to feed their country and they had to import 40 million bushels of American wheat. And in the United States, we only need 3¼ million farmers to feed this entire nation, feed us better, and have a surplus for export.

How do we do it? I'll tell you how we do it—with productive machinery developed by American manufacturers and well used by American farmers working to make a profit.

In South America it takes 43 million farmers to feed their 191 million. And in Africa it takes 97 million farmers to feed their 351 million.

Socialist nations all over this world are looking to this capitalistic system this morning to keep them from starving to death.

His thoughts on Russia

Gentlemen, I have mixed emotions about selling wheat to the Russians. If you want to know my honest opinion, I don't believe in giving the communists anything until they knock down that Berlin wall and raise that Iron Curtain, get out of Cuba and Angola and release 900 million people they have captured since the end of World War II.

Then I would sit down and do some hard-nosed bargaining. I'm one American who is sick to death watching the communists gobble up one nation after the other, until today we're virtually an island in a red sea.

Get involved in the things that are going on around you, gentlemen, and accept the responsibility of citizenship. Choose your leaders with greater car and relearn the art of self-discipline.

Learn and teach there is no such thing as a free lunch. And teach that there is no place in our society for award or punishment that is not earned. And learn to teach that freedom is inseparable from responsibility.

These people who are always downgrading our country and downgrading God remind me of the boy who murdered his mother and father and then threw himself on the mercy of the court becuse he was an orphan.

In fact, I heard about a liberal church that put a sign out in front one Sunday that said there was no hell. And a little fundamentalist church across the street put out a sign twice as big that said, "The Hell There Ain't!"

I'm going to close with this story. A lady came up to me after a meeting one day, and she was crying, and I said, "Lady, what's the matter?" She said, "I'm just so nervous and upset. I just believe the whole world's coming apart." She said, "Do you think if I went into a room and prayed about all these problems, God would work everything out and then I wouldn't have to worry any more?"

I said, "Lady, none of us pray enough. We ought to pray every day. We ought to pray for the President, and the leaders of our conutry, and all those in authority. We ought to pray for each other."

And I told her this story about an old country preacher out in Dallas, Texas. He was more than just an old country preacher—he was a big one. He was about 6 feet 8 inches tall. He went out to Los Angeles to do a little preaching a few years ago. When he got to L.A., he went out in Pershing Square. He got up in the park, stepped up on a cement abutment and opened his Bible and started preaching an old-fashioned gospel sermon. He had been preaching for about 15 minutes when a big crowd had gathered to listen. Then one of the boys from the university came by and he got up on a soap box and started heckling the preacher. He'd say, "Hey, preacher—this God you're bragging about—man, he can't be all that powerful. If He's as great as you say He is and He can do all these miracles, I want to see you pray one time and see if he'll knock me off this box."

The preacher didn't pay any attention. He just kept on preaching. But this fellow wouldn't stop. He'd say, "Hey, Minister, I don't think you heard what I said. I said this God you're bragging about, if he's all that great and all that powerful and he can do all these things, why don't you pray one time and see if he'll knock me off this box."

Well, that kept on for 20 minutes, and finally that old preacher just stopped, as though he had heard him for the first time. He closed his Bible, he stepped down off that cement abutment, he walked over to where that fellow was, drew back, and that preacher must have knocked him 30 feet. And he walked over to him, looked down at him, and he said, "Let me tell you something, and don't you ever forget it. I never asked God to do anything for me that I can do myself."

That's my answer to people who sit back and say, "Let somebody else do it."

Gentlemen, we have a great future because of great people just like you all over this land. But I am convinced that unless America has a spiritual revival, unless we have a clean-up of morality in this country from top to bottom, and a total rededication and commitment to those same ideals that our forefathers had when they sat down at their first meeting, the day might come when you will be sitting on your porch one afternoon trying to explain to your great grandchildren how it used to be when you lived in a free America.

I want to thank you for the privilege of letting me stand up here today to give three cheers for God and our wonderful country. You have been a delightful audience. I hope you will have a tremendous convention and a very successful year.

Thank you very much and God bless you. (Applause as all stood)

President Dennis: Mr. Remley, we wish to thank you for a very powerful and inspiring address.

President Williams: The Roadmasters will reconvene at 1:30 this afternoon in this room and the Bridge and Building Association will reconvene at 1:30 P.M. in Regency Room "D," not the room where we were yesterday.

If there is no further business to come before this session, we are adjourned.

. . . Recessed at 11:55 A.M. . . .

AFTERNOON SESSION

September 14, 1976

President Williams: The Meeting will please come to order. The Second Meeting of our 81st Annual Convention is now in session.

The first feature this afternoon will be the Report of Special Committee No. 1 "Problems Encountered in Remodeling Existing Buildings." Mr. W. E. Halley is the Sponsor. The Chairman is Mr. W. C. Sturm, senior project engineer, EJ&E, and a Director of our Association. Will Mr. Halley, Mr. Sturm and any members of the Committee that are present please come forward

Problems Encountered In Remodeling Existing Buildings

Committee Report

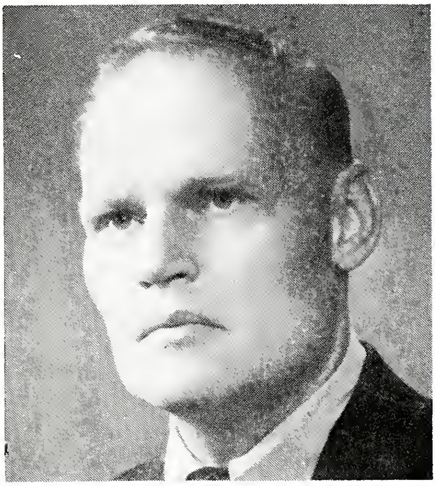
COMMITTEE—W. C. Sturm, *Chairman*, sr.proj.engr., EJ&E, Joliet, Ill.; E. B. Dobranetski, *Vice Chairman*, B&LE, Greenville, Pa.; D. Bessey, arch., CMSP&P, Chicago; C. R. Lund, asst.supvr.bldg.mtce., CMSP&P, Chicago; Paul Saletnik, stf.engr.bldgs., C&NW, Chicago; and W. F. Stokes, gen.fore.trk., ICG, Chicago.

Introduction

Remodeling can generally be defined as reconstruction of an existing facility to restore it to its former state of efficiency. There are, however, many reasons for the decision to remodel an existing building. A change in the assigned function of the building or a change in the corporate structure which affects the layout of the building or an individual area may call for remodeling to accommodate these changes. Renovation or upgrading of an older building may be necessary to improve working and employee morale. Often an older building may have deteriorated to a point where routine maintenance work is unable to maintain the structure and a general rehabilitation is necessary to restore the building as a viable working area. Any of these factors or a combination thereof can contribute to the decision to remodel.

Inspection

Prior to considering remodeling a building a thorough inspection should be made to determine the suitability of the structure for its intended function. Three basic points must be considered when inspecting the building—functional suitability, structural suitability, and maintenance factors.



W. C. Sturm

The building must first be evaluated from a functional viewpoint. Taking into consideration the activities of the current or proposed occupant, space must be made available to provide an environment conducive to the efficient operation of the function. Rearrangement or alteration to the spaces in order to make them more appropriate must be considered. These proposed alterations must be practical and economically feasible. If the building can reasonably contain the proposed function then further inspection is warranted. If not, alternate buildings or spaces should be considered at this time.

Structural suitability should then be determined. If the builder is to be subjected to loadings significantly greater than those wor which it was originally designed, structural calculations should be made. This is particularly true if heavy equipment, such as Data Processing equipment, is to be installed. The functional requirements may also necessitate structural modification, for example, the removal of a bearing wall to create a larger open space.

Any major structural problems should be evaluated. The structure should be checked for signs of settling or movement and the cause determined. Foundation walls should be checked for cracks and evidence of leakage. Exterior walls and bearing partitions should be examined for cracks and extent of tuckpointing determined. Door and window lintels should be inspected for signs of deterioration or excessive deflection. Concrete structural members should be inspected for excessive spalling and exposure of reinforcing bars. Steel structural members should be inspected for reduction of section due to rust or corrosion. Any visible defects such as shear cracks, excessive deflection and loose connections should be noted. The roof system should be inspected, cause of leakage should be determined and the overall condition of the roof mat system and the flashings should be evaluated. The general condition of doors, windows, ceilings, walls and floors should be noted.

Maintenance factors should then be evaluated. Although the building may be currently in satisfactory condition it must be determined if major maintenance will be required within the foreseeable future. For example: Will the roof require replacement shortly? Is the heating system and piping approaching the point of replacement? All of these factors must be considered to determine the suitability of a building for remodeling. No matter from what standpoint a designer evaluated the suitability of a building, he should always keep asking whether or not all the expense and effort involved in remodeling an existing building is really worth it. In many instances, construction of an entirely new structure may provide a modern building specifically tailored to the company's needs at a more economical price. Even if the cost of constructing a new building is not less than remodeling, savings may still be experienced if compared to the projected maintenance costs. Therefore, life cycle costs of the proposed remodeling project must be compared with those for a new building. Regardless which course a designer chooses to follow, he should always keep an open mind and research all available options.

Codes

The designer must insure that all applicable codes are complied with. Items that may have been allowable at the time the building was initially constructed and, therefore, beyond the scope of newer more restrictive codes, may now have to be resolved. Areas with which particular attention will have to be given are:

(1) Life safety codes (number and type of exits, sprinklers, occupancy requirements)

(2) Sanitary requirement (number and type of fixtures, materials for floors and walls)

(3) Electrical requirements (wiring may have to be brought to current standard)

Additionally, local codes may be more restrictive than national codes and may contain provisions which, for instance, may require the building to be accessible to handicapped persons. A thorough check to insure compliance is necessary as much additional work may be required to bring the building to current standards, thus greatly altering the cost considerations.

Mechanical systems

When remodeling a building it is often desirable or necessary to upgrade the mechanical systems. Often older buildings have antiquated radiators which may be replaced by fin-tube elements to provide more efficient heat and a cleaner appearance. Piping, valves and traps should be inspected to determine if replacement is warranted as part of the remodeling. It is generally advisable to change out piping which will be concealed after remodeling so as to obtain a fresh start with a maximum expected life. If the existing heating plant requires a great deal of maintenance, is of inadequate capacity or could be converted to a cleaner and more economical fuel, now is certainly the time to consider replacement.

Many older railroad buildings are air-conditioned by individual window units which were installed piecemeal over the years. Remodeling often gives us the opportunity to replace the window units with a central unit. Advantages to a central system include a reduction in maintenance expense compared to multiple window units and a greater life expectancy for the equipment. Consideration should be given at this time to potential reduction of heat loss and gain. This can be accomplished by additional insulation for the building, pipes or ducts as required. Large window areas can be reduced. Older buildings depended on large windows for natural light and ventilation, whereas, today greater emphasis is placed on artificial lighting and mechanical ventilation and cooling. If a roof-mounted central air-conditioning unit is contemplated, care must be taken to insure adequate structural support. Adequate thermostatic controls for both heating and cooling should be provided.

Sanitary facilities must be evaluated to determine if they are adequate in number to accommodate the anticipated building occupancy. Remodeling may present the opportunity to replace existing piping and correct existing problems. Once again it is advisable to replace any marginal piping or fixtures during the remodeling process. If new sanitary facility areas are to be included in the design availability of existing service and drainage lines must be considered.

Remodeling of a building will often require additional electric service. To fully evaluate the requirements you must go back to the primary source, the transformer. Whether railroad owned or a public utility it must be able to handle the required increase or be replaced.

Assuming that sufficient power is available inevitably remodeling will require that receptacles and light switches will have to be relocated in order to accommodate revised placement of desks and equipment. This will often require the channeling of existing ceilings, walls and floors to relocate service runs for the outlets and switches with the accompanying cost of repairing plaster, tile and painting. One alternative solution is the use of surface raceways. This equipment is available from many companies with one common advantage —versatility. The raceway comes in many styles and colors and can readily be incorporated into the present system. Flat-pancake styles are available for floor receptacles and telephone cables, thin two-wire styles wall mount for switches, and large square styles are available to handle multiple-circuit cables.

Low-voltage switching systems should be considered when a light is to be controlled from three, four or more points. In these instances the wiring is decidedly complicated and expensive due to 4-way switches, long wire runs and additional labor, yet lights controllable from numerous points may be very desirable. Therefore, the low-voltage switching system makes it possible to control lighting circuits from numerous points at a reasonable cost. It is also desirable to arrange the lighting circuits so that minimal lighting can be provided for off-hour tasks such as cleaning, thus reducing the energy consumption of the building.

When upgrading the lighting during remodeling, fluorescent fixtures should generally be used to replace existing incandescent lamps. The greatest single advantage of fluorescent lamps is their efficiency. They produce two to three times greater light per watt of power consumed while producing less heat. The quantity and quality of light for task purposes is also better when using fluorescent lighting.

The need for additional mechanical systems should be investigated. Remodeling can make feasible the inclusion of elevators or escalators, improved communications systems, sprinkler systems, smoke detectors or improved security systems. Each of these must be evaluated on their own merits based on the needs of the occupied space and governing codes.

Materials

The decision to remodel an existing facility presents the designer with the oportunity to utilize more modern and more easily maintainable materials. The designer must determine whether or not the quality of architecture expressed in the existing building is worth preserving.

Although there are existing buildings which have a distinct and unique form of railroad architecture which is worth preserving, the vast amount of buildings found in our nation's railroad yards have no appreciable architectural character. Therefore, in most instances economics will dictate. Satisfying functional and physical requirements as economically as possible is of prime consideration. Simplicity and consistency are the keys to meeting this challenge. The designer must differentiate between situations where it is appropriate to seek a definite architectural character as opposed to those requiring a quick and simple solution which satisfies all functional and physical needs. This must be kept in mind when selecting replacement materials. If this philosophy is adhered to the appearance of our buildings will be inherently improved.

Materials should be selected with strong emphasis on their maintainability. Life cycle cost must be considered as well as initial cost. Public areas should have durable and serviceable material.

Windows often require replacement during remodeling. Depending on the character of the building many different methods may be used. In office buildings which are air-conditioned and in which the ceiling is to be lowered and suspended, windows of much less glass area may be employed. In shop areas deteriorated wood windows may be replaced with fiberglass panels or with glass block.

Flexibility

One factor that must receive adequate attention when remodeling office areas is the problem of flexibility. Departmental structure is subject to periodic change which necessitates the regrouping of personnel for optimum efficiency. The open-office landscape plan provides the required flexibility. While making more efficient use of the total available space, it has been proven that approximately 25% more people can be accommodated in the same amount of floor space with the open-office plan, as opposed to conventional offices. When planning open office areas it is necessary to consider each individual's needs as far as job function and required contacts with other people. It must be determined where absolute privacy is required, and provide conventional floor-to-ceiling private offices. Normally this will result in a central office area with closed executive and administrative offices around the perimeter. Essentially equal facilities should be provided for people at equal levels of responsibility. Informal conference areas can be interspersed throughout the open-office area for use by those individuals whose work areas do not accommodate visitors. Once the functional needs of the work environment are satisfied, coordinating the decor becomes largely a matter of selecting colors and fabrics. A well-designed, cheerful environment is most conducive to productivity. The addition of living plants enhances the overall visual effect.

Open plans should be constructed with easily relocatable materials which will allow for future changes, movable partitions, either free standing or full height, allow spaces to be reorganized with minimal effort. Suspended ceilings with grid arrangements allow lighting and registers to be economically rearranged.

Some negative reaction can be expected initially from employees who feel they are losing their privacy. This is, however, generally a temporary reaction and most employees prefer the open concept to the traditional office layout.

Any time you plan a building in the traditional closed office arrangement, there is a lot of wasted space. Open-office areas enable you to tailor your space for maximum utilization. The result is not only more efficient space planning, but better designed work areas and a more productive total environment.

Operation during construction

Often operation of a facility must be maintained during construction. It is imperative that construction interference with normal operations be kept at a minimum. An open line of communication must be maintained between the designer, contractor or foreman, and the building occupants. Planning and scheduling of work should be organized in a manner that enables a smooth relocation of occupants from existing areas to remodeled spaces. As new facilities are completed, they should immediately be occupied by vacating areas remaining to be remodeled.

The critical factor, however, is safety. Protecting company personnel and the general public from all possible construction hazards should be the prime concern. Remember most office personnel are unfamiliar with construction hazards. Where possible physical zones should be established which separate construction areas from usable work space. Boarding up or roping off construction areas are the most common methods. Some of the more common physical hazards are:

(1) Potential electric shock from bare wire or removed panel covers.

(2) Tripping hazards from stored material, scraps, extension cords or tools.

(3) Dropped tools or materials.

(4) Fire hazards from material such as paint, thinners or sawdust.

Noise, dirt and other such construction annoyances, although unavoidable, should be controlled as much as possible. Solid barriers can help to minimize these problems. Scheduling work during off-peak hours may also help to decrease disturbances. This could be costly if overtime wages must be paid; however, some advantages may be regained by greater working efficiency.

Services must be provided to permit the employees to perform at their fullest capacity while the remodeling work is being progressed. This may involve the temporary relocation of phone extensions, equipment and electrical outlets and must be considered a part of the remodeling cost.

Whatever the particular circumstances are, careful consideration of all facets of the project with all interested parties will help to minimize the confusion that almost always occurs. Although in many situations it is virtually impossible, the temporary relocation of building occupants can eliminate a great deal of unnecessary confusion.

Conclusion

Virtually every consideration when deciding to remodel can be directly translated into dollars. A comparison of these figures to the costs involved in construction of a new facility should reveal the most economic solution.

Life-cycle costs must be evaluated. Remodeling an existing building may initially be more economical than new construction. Considering the maintenance requirements and utility costs of the two options may reveal the opposite result.

Construction time also must be considered. New construction may be more economical but would require a year or more to build. Remodeling an existing facility could reduce construction time with a resultant savings. Every situation is unique and must be judged individually.

One word of caution concerning remodeling projects. More often than not something totally unexpected occurs during a remodeling that puts the project over budget. It is difficult to predict possible problems in any construction operation. In remodeling, the problem is compounded due to lack of sufficient technical data and actual field information. Therefore, when appropriating funds, an adequate contingency factor should be anticipated.

President Williams: Thank you Mr. Sturm and your Committee Members.

Will Mr. Noyszewski please come forward and introduce the next speaker?

(M. Noyszewski introduces Mr. Robert L. Cragg, president of the Earle Gear & Machine Company, Philadelphia, Pennsylvania.)

An Introduction To Moveable-Bridge Operating Machinery Inspection Procedures

By ROBERT L. CRAGG, P.E.

President, Earle Gear & Machine Co., Philadelphia, Pa.

Mr. President, members of the American Railway Bridge and Building Association and distinguished guests. It is a great honor and personal pleasure for me to have the opportunity of addressing the body of this outstanding organization. I hope the remarks I shall offer will assist you in your daily efforts.

The topic which M. Noyszewski suggested concerns the vital but frequently overlooked package of machinery that, hopefully, causes movable bridges to move when called upon to do so.

What is a movable bridge? One definition is: A bridge that will permit the flow of traffic in one mode—while obstructing traffic in other modes. Yes—they're expensive to build; certainly a necessity; sometimes exciting; and, frequently, an inconvenience—particularly when broken down or at times when they fail to operate properly and receive much unwanted publicity.

Machinery gives good service

In order to reduce the inconvenience suffered by such unscheduled service interruptions, it is necessary to maintain the machinery and associated structures in first-class condition. At best, this is difficult for any number of reasons—insufficient funds; lack of qualified personnel; priority of other jobs—to name a few. The fact is, operating machinery has been designed and manufactured to stringent and exacting specifications imposed by the engineer, the AREA, AASHTO and AGMA, among others. It is rugged, dependable and safe. It will provide many years of reliable service provided it is accorded proper attention and maintenance.

No doubt a paradox exists as a result of the reliability of such equipment. The fact it continues to operate under most adverse circumstances results in giving it little attention and causes us great shock when ultimately it fails to operate properly. Additionally, machinery suffers another malady since, normally, it is out of sight and out of mind to the users of the bridge, to visiting dignitaries and to others. Thus, it often does not receive even the cosmetic attention rendered to other more visible members.

However, machinery is a somewhat complex system of interrelated precision components which constantly are exposed to a hostile environment. Dirt. corrosion, foreign materials and pigeon droppings constantly menace the members. Winds, heavy loads and misalignments impart shocks of unknown magnitudes upon the system. Erosion, shifting of foundations and distortions resulting in unsatisfactory operation and, ultimately, failure of gears, bearings and other machinery elements.

There are, I suppose, times when it appears that nothing changes. Picture the dilemma faced by the railriad officials, the engineers and other curious observers as they walked out on what remained of their bridge about 1870, peered cautiously over the edge at the fallen span and dunked locomotive: stuck their hands in their pockets and exclaimed: "Well, I'll be; it did fall down!"

Now, a century later, we see the situation has not changed substantially as, once again, the engineer, the town fathers and other interested spectators look over the edge of an approach span at a leaf collapsed into the channel, stick their hands in their pockets and exclaim, "Well, I'll be; it did fall down!"

The unfortunate fact is, in the case of today, at least—something could have and should have been done to avoid the potential danger and resultant inconvenience, to say nothing of the great costs of emergency repair. Prior to failure, the trouble signals should have been spotted and proper maintenance and repair conducted to avoid the catastrophic collapse.

This, then, is our purpose today—to discuss movable bridge operating machinery and look into inspection, evaluation and maintenance of this vital equipment.

Maintenance starts with inspection

Inspection, defined, is the observation and critical appraisal and evaluation of the machinery elements. It is the point from which a sound maintenance program starts.

The purpose of an inspection is to recognize and detect wear and distinguish between normal and abnormal conditions. The first is inevitable and the second subject to correction.

An inspection is the development of logical evaluation procedures which lead to valid conclusions. In order:

(1) The machinery is viewed as a power-transmission package.
(2) Each component bears a definite relationship with other parts and elements.
(3) And, each condition has a cause.

During an inspection, thorough field observations are first obtained and correlated with original specifications and "as-installed" conditions. Evaluation of those observations is then conducted by ones experienced in machinery design and operation. Finally, appraisal of the conditions permits development of proper conclusions and recommendations for maintenance and repairs.

Through such procedures and regular inspection programs, a dossier of the changing condition of the machinery may be established, progress of wear may be recorded and a delineation of causes established. Together with this, planning may be completed for routine maintenance as well as preparing for correction of major deficiencies.

In the short time available this afternoon, it is not possible to investigate all the facets of these important considerations. In fact, we shall only be able to touch upon the highlights of proper programs. However, it is hoped that these short remarks will direct your attention to the efforts required and assist you in future planning toward assurance of safety, reliability and integrity of the movable bridges in your systems.

It should be pointed out, first of all, that nothing is so constant as change and the lack of absolutes in the design, method of operation and arrangement of operating machinery on movable bridges. Many talented and ingenious people have introduced their concepts to bring about the present-day state-of-the-art. Thus, although the remarks I shall make about machinery arrangements and components generally are consistent and true, other different and unusual machinery combinations will be found on some bridges.

What is operating machinery?

Essentially it is a power-transmission train whose purpose is to transmit input energy and convert it to such a form as to cause the bridge to rise, descend or swing.

The elements comprise:

(1) An energy source; electric motor, internal-combustion engine, hydraulic motor, horse, mule or human power which introduces rotary motion to;

(2) A series of gears and shafting; or, at times, chains and sprockets that reduce the speed and increase the torque to;

(3) A final member, normally called a rack pinion, which engages a companion piece, normally called a rack, thereby introducing motion to the span.

The slide at which we are looking illustrates, in line drawing fashion, the elements just described. These include the motor, brake, primary and secondary gear reductions, rack pinion, rack and associated bearings and couplings.

Of course, due to the varying widths, lengths, weights and design options, these elements can be used separately or in concert with one another in many different ways.

For instance, in the case of bascule bridges, customary design would utilize a totally enclosed differential reducer in the primary location followed by one or more open-gear reductions. Present-day state-of-the-art would comprise not only the primary differential reducer but also totally enclosed secondary reducers.

The purpose of the differential reducer is to provide load sharing to assure even loading of all machinery driving the leaf. In the case of two-leaf bascule bridges, each leaf requires an operating machinery system. Typically, the total speed reduction from the motor to the rack pinion is about 400:1. Thus, for an 870-rpm motor, the rotational speed of the rack pinion is about 2 rpm and, usually, about two revolutions of the rack pinion are required to open or close the span.

Torque requires massive construction

Please observe that, as the speed is reduced, the torque is increased proportionately. This is evidenced by the more massive shafts and gears which are capable of supporting greater loads.

In addition to the machinery required to move the leaf, there are other elements and devices required in the system. These include buffer cylinders, live load shoes, centering devices, tail locks and span locks.

Of the many types of bascule bridges, including trunnion; Strauss or heel trunnion, Scherzer or rolling life and others, the most common type for railroad usage is the rolling-lift bascule bridge.

In concept, the rolling-lift bridge is actuated by a rack pinion mounted on the span which traverses a straight rack that is stationary and fixed to the foundations. The leaf has curved, track plates affixed to the bascule girders that support and carry the weight of the leaf and counterweight. On the pier are flat track plates which the curved plates roll upon as the pinion moves along the rack. You will notice the centerline of the rack pinion is the center of the curved track plates so that, as the leaf rotates, the pinion axis is moving in a horizontal plane.

Bascule, incidentally, is a word derived from the French and literally means see-saw. Thus, a bascule span is a balanced span as evidenced by the counterweight. In essence, little work is required in raising or lowering a bascule leaf to overcome frictional losses.

The design must include sufficient power to overcome the major loads; those imposed by wind, snow and ice. The machinery for this type of bridge is mounted on the span and moves together with the leaf.

Vertical lift is hung on wire ropes

Vertical-lift bridges, rather than having a rotating leaf, utilize a rigid movable span that is hung by wire ropes passing over sheaves at the top of towers on each end of the movable span. The opposite ends of the ropes are attached to counterweights. Channel clearance is then obtained by vertical movement of the span. Although there are many types of vertical-lift bridges, we shall look at just two which are most common to railroads. These are called tower drive and span drive.

On a tower-drive bridge, movement of the span is caused by driving the rope sheaves. A close balance exists between the span and the counterweights such that the transfer of the weight of wire rope traversing the sheaves results in a span side or counterweight side unbalance, depending upon whether the bridge is open or closed. In some instances, this weight transfer is so great that balance chains on the counterweight side are provided to offset the gross change.

A tower-drive bridge requires two complete drive systems, one on each tower. Each appears similar to the equipment on a bascule bridge. However, observe that the reducer is not a differential type and, instead of a rack, the final gear is a full ring gear affixed to the rope sheaves. The system includes means to assure seating the span firmly on the piers at all four corners. An adjustable coupling in each towar drive helps level the two corners at the end controlled by that drive. The two ends of the span are kept level electrically through a Selsyn system.

On a span-drive bridge, the span is again hung by wire ropes which pass over tower sheaves and connect to counterweights. However, in this design, the tower sheaves are not positively driven but are caused to rotate by friction of the ropes. The machinery package is located in the middle of the movable leaf. Then, by use of line shaft and right angle speed reducers, operating rope drums are driven to move the span up and down the towers. The operating ropes wrapped around the operating drums, called up-haul and down-haul cables, are secured respectively to the top and bottom of the towers.

The two types of vertical lift bridges just described have a number of other machinery arrangements, but the operating principle remains unchanged.

Bridge is swung horizontally

The third type of movable bridge you will encounter is the swing span. As the name implies, this type bridge is one that swings in a horizontal plane to open or close the channel to traffic. Basically, it is comprised of a span sitting on a central pivot pier. In the closed position, the ends are stationed on rest piers at the sides of the channel. Rotation is introduced by machinery located on the span which drives a pinion, or pinions, around a ring gear, or ring gear segments, affixed to the central pivot pier. It may be seen the center of gravity of the span must be coincidental with the center of rotation. Lateral, horizontal forces resulting from wind are counteracted by means of balance wheels on the span that roll on a stationary rack positioned on the pivot pier.

The components are similar to other operating machinery except it normally is required to provide a bevel gear set to drive the rack pinion around a vertical centerline. Live loads on swing spans usually are carried by devices called wedges located at each end and along girders at the rest pier. In addition, the machinery to drive the center and end wedges and locks is a detailed and complicated system within itself. Also, in many instances, in the case of long spans, the vertical deflection of the ends is sufficient to require jacking in order to position the end wedges.

In all cases, the machinery is adequately designed and manufactured to more than fulfill its function and provide many, many years of reliable service with only a minimum of attention and maintenance.

However, it is important to:

(1) Provide an adequate supply—not too much, not too little—of proper lubricant for all interfaces between rotating and nonrotating parts and other members subject to corrosive damage and wear.

(2) Detect and correct difficulties immediately, before a minor problem matures to a major emergency.

Every result has a cause; every problem a source. And, many times, the cause is well removed from the problem as observed and manifested.

Therefore, it is essential to:

(1) Observe, measure, record and interpret indications of trouble on the machinery components;

(2) Distinguish between normal and abnormal conditions, and

(3) Determine proper corrective action, based upon analysis of the data, for routine maintenance as well as long-range improvements and replacements that may be required.

Inspection is essential

The only way in which this may be accomplished is by regularly scheduled thorough inspection and evaluation of the machinery components. In this manner, a regular history of the bridge may be developed and maintenance programs formulated so the unscheduled interruptions are avoided.

An engineering evaluation, or inspection is divided into three distinct phases:

(1) Preparation and planning

(2) Performance of field observations

(3) Preparing the final report

Time will not permit a discussion of each of these items in detail. However, each is highly important and a reliable job cannot be done unless all are given proper attention.

Suffice to say, all too frequently no time is devoted to preparation. Often, the only advance notice received by the inspector is that amount of time it takes him to travel from the office to the bridge site.

Our experience indicates that, to make an inspection meaningful, it is desirable to pre-study the drawings, to become familiar with the bridge and its machinery, to review prior inspection and maintenance records, to be equipped with the proper tools and measuring instruments, to prepare forms for recording measurements and observations and to make certain the time selected for field inspection is appropriate. Of course, it must be understood that in certain cases of emergency breakdowns, the ideal approach cannot be fulfilled and that advance preparations cannot be completed. In any event, the time spent in preparing for field work and planning a logical procedure for obtaining observations will more than pay for itself in time saved in the field as well as enabling one to perform a thorough inspection.

Each of the machinery elements has a specific function and operating characteristics. Each is subject to wear, deterioration, improper installation or subsequent maladjustment. During an inspection, the indications of wear and deterioration must be observed and physically measured or evaluated; the cause, normal or abnormal, determined; and suitable corrective maintenance and repair recommendations formulated.

One of the most important characteristics an inspector should possess is that of curiosity—the ability to ask questions. What caused the gear to fracture; why is the bearing worn egg-shaped; why won't the northeast corner seat on its live-load shoe; and the further tenacity to seek out the answer.

Frankly, the easiest course of action

is to replace or repair the worn part; but, too often, this does not solve the problem; it is merely overlooked and no remedy provided.

Determine cause of failure

Replacement of a failed member is merely an invitation to failure of the replacement—unless the cause of the failure is identified and corrective measures taken to eliminate the cause.

Now, having properly prepared for an inspection, the inspector is on the site and ready to go. Just what does he look for; where does he start; how does he obtain measurements; how are they recorded; and how are those reported?

Proper planning will answer many of these questions. However, in a general manner, the suggested attack is:

(1) Talk with the operator to determine his comments on the overall operation and any problems or unusual indications he has noticed. At this time, the inspector must arrange for communications with the operator so that the bridge cannot and will not be operated without clearance from the inspector. This safety measure is a *must*!

(2) After arriving in the machinery room, have the span operated through several cycles to audio-visually observe its performance.

(3) With the span in a stationary position, obtain physical measurements and observations of gear teeth, gear/pinion backlash, contact patterns, presence of lubrication, corrosive deterioration, condition of keys and keyways, and investigate any indications of cracks in the hubs, spokes or teeth.

Bearings are to be checked for running clearance, worn or broken liners and sleeves, presence of lubrication fittings, and the conditions of bolts and fasteners.

Shafts are to be observed for their general condition, paying particular attention to any evidence of cracks in the vicinity of keys, shoulders or other locations where stress risers might exist.

Observe the condition of couplings, the presence of bolts and seals, as well as the presence of lubricants.

Check the trunnion alignment and security of fasteners; adjusting collars and condition of trunnion bearings.

Observe the operation of buffer cylinders and check the operating pressure with a gage. Span locking and wedge systems should be observed and thoroughly inspected—the gears, bearings, linkages, guides and receiving sockets.

In cases of vertical-lift bridges, other members such as counterweight sheaves, wire ropes, span guides and rollers—centering devices and rail locks must be included.

(4) If possible, obtain an indication or measurements that will permit evaluation of the balance existing between the span and counterweight. Sometimes it is apparent when observing the operation that the installation is span or counterweight heavy—although, to quantitatively identify the condition, either mechanical or electro-mechanical means are required.

Take color photographs of all conditions that need to be considered during evaluation of the collected data. Such photographs not only record conditions but also are very helpful to people reading the report in understanding the conditions that exist.

(5) In addition to these general items, any given bridge might have other special equipment—such as emergency drive systems—that should be included in the inspection.

On most movable bridges, the power-transmission train is comprised of a series of gears and pinions together with associated shafts, bearings and couplings. Therefore, a knowledge of gears and their characteristics is desirable.

Gears provide operating condition

Normally, gears are cut to an involute shape and conform to American Gear Manufacturers Association standards. Of course, on older installations, this is not true and you will come across cast tooth as well as other tooth forms. The condition of the gears can provide much information regarding operation of the bridge. It is important that proper tooth form and contour be maintained. Ideally, 80% to 100% full-face-width contact should exist between a gear and pinion. A visual inspection of the wear pattern will give evidence of the tooth-to-tooth contact. If this condition does not exist, there are several possible causes and observable results that may be determined by inspection of the teeth:

(1) Cross bearing, where heavy contact occurs on the ends of the teeth and on opposite sides. This condition results from the pinion and gear being cocked to one another due to the centerlines not being in the same plane.

(2) End bearing, where contact exists on one end of each tooth on both sides. This is another type misalignment having the axes in the same plane but not parallel.

(3) Axial displacement of the gear and pinion will result in only partial tooth contact.

(4) Another condition that may occur is improper center distance between the gear and pinion. This may be checked by observing the relationship existing between the scribed pitch circles on the ends of the gear and pinion teeth. The pitch circles should be tangent to one another—not overlapping and not separated.

Of those, the worst condition is that of overlapping since backlash is removed and it is possible to jam the teeth together so hard that contact exists simultaneously on both sides of the teeth causing binding and interference wear.

Backlash, or clearance between mating tooth surfaces at the pitch circle, is important to satisfactory gear performance and should be maintained as specified. It may be measured using feeler gages inserted between mating teeth.

Since most gearing on older bridges is open and exposed to the entry of dirt, foreign material, rain and snow—the gears are subject to abrasive wear, scoring, pitting and corrosion. Thus, it is necessary to maintain the proper type and quantity of lubricants on the teeth. A further detailed description of gear tooth wear and failure is described in the AGMA bulletin included with the material given out today.

Wear of gear teeth may be determined several ways—the two most popular being chordal tooth thickness and span measurements. To obtain chordal thickness, a gauge called a tooth vernier is used; while span measurements may be obtained with a normal vernier caliper. Once having calculated the original condition, the amount of wear can easily be observed by comparison to current measurements.

On most movable bridges, the bearings and pillow blocks used are of the sleeve type—although more recent installations are equipped with rolling element, ball or roller bearings.

Inspection of rolling-element-bearing pillow blocks is relatively simple since most units are completely sealed and require only a visual check of the housing, seals, fasteners, lubrication fittings and general conditions. In the case of large-diameter roller bearings used on counterweight sheave trunnions, it is recommended that any inspection or repair that requires disassembly of the units be undertaken only with the assistance of a qualified bearing serviceman.

Sleeve-type bearings do lend themselves to thorough field inspection and will contribute clues to problems or potential difficulties in the system. In addition to a visual inspection of the housing and fasteners, the internal, or running clearance shall be determined and its location noted. One means of obtaining this is by use of feeler gauges inserted between the shaft and bearing liner. Frequently this will be impossible and other means will be required—such as placing a dial indicator on the shaft and jacking the shaft to obtain a reading of the total movement. The location and amount of clearance should be recorded for both ends of the bearing as this will provide evidence of the existence of misalignment and indicate its orientation.

In the case of split bearings, the top, or cap, should be removed whenever possible. This will permit inspection of the condition of the shaft and bearing liner for scoring, pitting or cracks as well as the condition of the lubricant grooves and supply.

Now, having made observations on both gears and bearings—the observed data and conditions may provide a correlation between the two and suggest corrective measures required, if any. For instance, if severe end-loading or cross-bearing exists in the gears, I should strongly suspect to find evidence of shaft misalignment through the bearing.

If this condition is permitted to continue, the possible result could be an inoperable bridge due to failure of the gear or destruction of the bearing.

Corrective action includes properly aligning the gear and pinion and reshimming the bearing accordingly.

Early discovery of such conditions is essential so that corrective action may be implemented before the members have gone beyond the point of no return and require complete replacement.

Report to management

The third phase of inspection is preparing the final report. This report is the basis for management decision upon maintenance or other corrective action and should include all observed data, field notes and measurements, together with conclusions and recommendations.

This afternoon I have briefly reviewed procedures followed on just two of the important members, gears and bearings, of bridge operating machinery operating systems.

Naturally, during an inspection, *ALL* elements must be accorded similar detailed investigation and analysis.

The responsibility placed into the hands of your inspection teams is tremendous. On the basis of their abilities, thoroughness and curiosity rests the continued safety, integrity and reliability of the movable bridges in your systems.

I strongly urge your formulation, implementation and support of programs that will enable them to perform meaningful inspections and field evaluations.

Remember, "Don't get caught with your spans down!"

President Williams: Thank you Mr. Cragg for taking the time to give us this valuable information. All of us who have to maintain movable bridges sincerely appreciate your sharing this knowledge with us.

Will Mr. Rankin please introduce our next speaker?

W. H. Rankin: As a continuation of the "Building" portion of the title of our Association, our next featured speaker is eminently qualified. He holds an AA in Architecture from the Los Angeles City College and a BA in Architecture from the University of Southern California. He is licensed in the States of California and Arizona. At the present, he serves as architect for the Santa Fe Railroad at Los Angeles and will now bring us an illustrated discussion on the Design and Construction of Buildings at the Santa Fe Barstow Yard. With pleasure I present to you—Mr. Richard Hale.

Design and Construction of Buildings at Barstow Yard

By RICHARD HALE

Architect, Santa Fe, Los Angeles, Calif.

Richard Hale

Santa Fe's Classification Yard was placed at Barstow because it is the hub for traffic from Northern California, Southern California and the East. The facility covers six hundred acres, is about four and one-half miles long and one-half mile wide. There are forty-four main classification tracks and four secondary classification tracks.

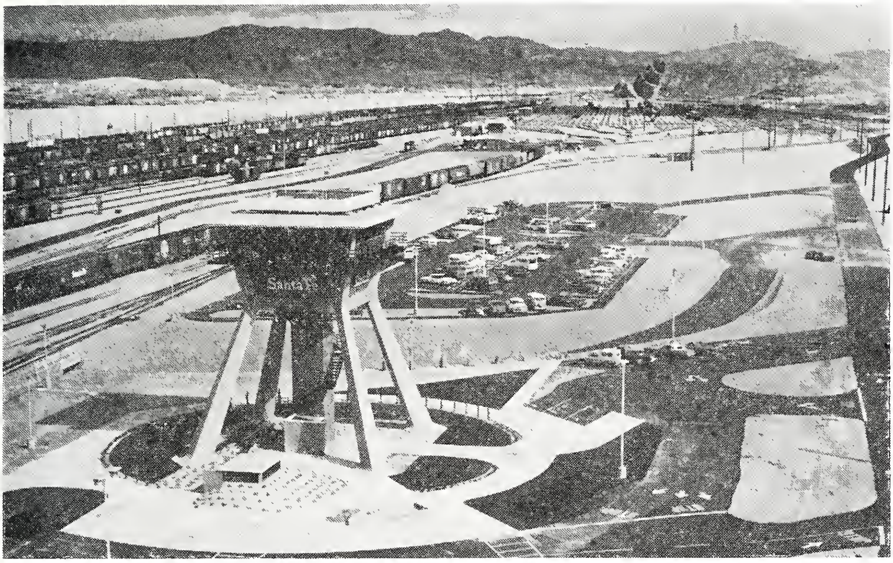
The hump has a roll-ability device and a weigh-in-motion scale. This information is transmitted to the computer, which in turn activates the retarders to the degree required to attain the proper speed for the cars to couple at the desired impact. The hump has the ability to process 2700 cars per day.

There are 35 buildings in the yard, ranging from the One-Spot (160'-0" x 170'-0") and the Terminal Office (120'-0") x 200'-0") to the Hump Conductors buildings (12'-0" x 16'-0"), with uses varying from offices, to shops, to garages, to laboratories, to storage buildings, to locker rooms. The diesel service facility is a one-stop facility at which the locomotives are inspected, fueled, sanded and minor maintenance, such as filters, brake shoes, lubrication, etc., is effected. Prior to placing the locomotives on the service pits, tests are made in the Spectograph Laboratory to determine the condition of the engines.

There are four towers in this complex—the terminal tower, which has complete control of the yard; the hump-masters tower, which controls the classification of cars for specific destinations; the bowlmasters tower which, by combining certain tracks, makes up the final train; and the diesel-service tower, which controls movement of locomotives through the service facility after required maintenance.

Due to the two-year completion schedule, the excavation, compaction and grading of 4,500,000 cubic yards of earth; the quarrying, crushing and spreading of 650,000 cubic yards of rock; the larger, more complex buildings were all put out to bid to general contractors. Some of the less complex buildings, the fencing and the entrance sign were done by the Bridge & Building Gangs.

The yard was conceived and designed by the Santa Fe Coast Lines Engineering Department (construction, architectural, hydraulics and bridge). After a thorough investigation, metal buildings were chosen due to excessive spans on certain facilities and lower costs over other types of construction. A single manufacturer was used to obtain a better price, keep a uniformity of siding design, color and keep to a minimum the erection problems.



In the main-office building, a cellular floor was used for electrical and telephone installation instead of the normal duct system to allow more flexibility. This in conjunction with the vinyl covered, full height movable partitions and the attic plenum concept allow for complete flexibility for future relocations.

The siding was selected to allow a minimum ten-foot span to the first normal girt. Sub-girts (1-7/8″ deep) at 2′-0″ centers horizontally were used to hold the 3″ fiber glass insulation in place and as the backing for the 5/8″ gypboard finish. This allowed for normal installation of electrical and telephone outlets within the wall. Formica-finished cabinetwork was used throughout the job for low maintenance and at a cost approximating wood-finish cabinets. Due to the intense heat and glare of the desert, graylite "14" was used in all windows.

A new concept was adopted in the design of the one-spot car repair and diesel service facility. The floor of the one-spot was ramped and recessed at the work area to a point 2′-0″ below top of rail. This allows most of the work to be done with the men standing, thereby increasing production greatly. The diesel service facility consists of four levels: The pit under the unit, a level for changing brake shoes while standing, one for fueling, and one at cab floor height. Due to this configuration and the number of operations performed at the same time, each track is capable of servicing 75 units per day.

The location, the Mojave Desert, created numerous problems during construction. Pouring of concrete was limited to certain hours of the day due to extremes in air temperature. Concrete pumping was used extensively due to inaccessibility. Using Vacculite (lightweight) aggregate concrete was pumped as high as 50′-0″. Another problem was created by the wind and blowing sand, causing the concrete to "flash," therefore keeping the pours to a minimum.

The terminal tower, as shown in the accompanying photograph, was designed using dynamic design because of the high winds and earthquake code requirements; as were all buildings and facilities. Due to the height, 50′-0″ to tower floor, and the 360° vision, the controller can see all parts of the yard at all times. The legs were precast at the site on casting slabs and weigh 37 tons each, using grade 60 reinforcing bars and 4500 psi concrete. They are 4'-0" x 6'-0" and the base and taper to 12" x 12" at the top. Two 50-ton cranes were required to place the legs. Precast concrete was used over cor 10 steel due to cost. The shape of the legs was dictated by the 30'-0" x 30'-0" tower floor area and the desire for stability. All members of the structure with the exception of the legs, are steel in order to reduce the weight and cost. The siding on all towers is color-coated steel sandwich panels with Urethane insulation. This creates a finish interior wall without additional treatment.

All contaminated fluids, other than sewage, are returned to an on-site treatment plant which is fully automated. After appropriate treatment, the fluids are returned to the city system after conforming to Environmental Protection Agency standards.

This was a most challenging and rewarding project due to the size, and the many new concepts which required a close working relationship with the heads of all departments.

President Williams: Thank you, Mr. Hale.

Will Mr. Iwinski please introduce our next speaker? (N. D. Bryant is introduced).

New Techniques for Concrete Restoration

PANEL DISCUSSION

Moderator: N. D. Bryant, bridge engineer construction, Frisco

Slide presentation by N. D. Bryant

Tray 1—Osmose and Dow

Slide 1. Have you ever had a concrete structure that looked like this?

Slide 2. Or this?

Slide 3. Or even this?

Slide 4. When you wished it looked like this?

Slide 5. (Blank)—It is now possible to restore concrete to its original structural integrity by the methods which will be shown in the following slides.

Slide 6. (Title Slide) Dow Paving System—Construction System in which polymer portland cement mortar or concrete is used to *restore* deteriorated and *protect* old and new bridge decks.

Slide 7. Typical deterioration due to freeze/thaw cycles—scaling of the top layer of cement paste.

Slide 8. Deterioration due to spalling of concrete cover over reinforcing steel. In this case, the steel was positioned

N. D. Bryant

high and adequate cover thickness was missing. The paint strip is the only protection over some steel.

Slide 9. A severe case of deterioration, which at this stage may be uneconomical or too far "gone" to salvage.

Slide 10. A concrete scarifier removes the top ¼ in. of concrete if the bridge has been under traffic. Oil pan drippings, surface treatments, tire rubber, etc., are removed in this manner to insure good bond between the overlay and the substrate concrete.

Slide 11. Inspection of the substrate to locate fractured concrete and plains of weakness which would prevent the overlay from being bonded to sound concrete which results in a monolithic acting slab again.

Slide 12. Hand chipping is necessary along the curb line where the scarifier could not reach and in these established areas of weak concrete (by inspection).

Slide 13. In this area, cracks in the substrate concrete indicated corroded resteel below the surface. Concrete is sawn along both sides of the re-bar 2 in. away and parallel to it and removed. Concrete is chipped away from the bottom of the bar to insure a ¾ in. clearance. This allows access to sandblast the steel to white metal, removing all products of corrosion. When the overlay is placed, concrete can be worked completely around the bar(s), thus coating it, reestablishing proper bond and restoring its contributory function to the slab system.

Slide 14. Full depth repairs are encountered many times. These may be filled with modified concrete or a Class A air entrained concrete.

Slide 15. An industrial RR track overpass is shown here with steep approach grades. The right lane has been restored fully; but the left lane shows exposed steel, much of which was replaced. It is ready for sandblasting and placement of concrete.

Slide 16. This picture shows the 5½ to 6½ in. depth of modified concrete used in 1968 to restore this deck.

Slide 17. A sweeper such as this aids clean-up of scarification dust and chipping rubble.

Slide 18. Washing off the deck near the end of the preparation phase can show up cracks and fractured concrete which may go unnoticed when dry and covered with dust.

Slide 19. Sandblasting of the substrate concrete surface and reinforcing steel within 24-hours of overlaying is the last operation in the preparation phase. Sandblasting the concrete in restoration of a deck removes all rehydrated dust from scarification and all other laitance on the surface.

In overlaying a new deck that has not been under traffic, this is the first operation in preparation of the surface. Sandblasting the surface of a new deck is necessary to remove the laitance that migrates to the surface with bleed water and the weak air dried surface itself. This laitance will interfere with establishing a good structural bond.

Slide 20. Prior to placement of materials, the deck is wetted down and kept moist for one hour. This reduces the suction of the old concrete and lowers the surface temperature on a hot day.

Slide 21. The deck in this picture has been scarified, sandblasted and wetted down. Prior to depositing mixed material on the deck, all standing and free water will be blown or broomed away.

Slide 22. This is a self-contained mobile mixer. It carries enough sand, coarse aggregate, cement, water and latex to produce 10-12 cubic yards of latex modified concrete or mortar. It can be calibrated for any desired blend of aggregates and bag mix. The DPS utilizes a 7 bag concrete mix or 8 bag mortar mix, both having a water-to-cement ratio range of 0.35-0.40.

Slide 23. Shown here is mixed material being deposited on the deck. To develop proper bond to the old concrete, some of the paste of the paste phase of the mix is broomed into the surface. This usually precedes the material placement by 3 or 4 feet.

Slide 24. Immediately behind the

mixer's discharge chute follows the finishing operation. This is a front view of the truss work which travels on rollers and rails across the bridge. Inside the pair of trusses spanning the pour width is an adjustable pair of tracks on which the carriage transverses back and forth.

Slide 25. This side view of the transversing carriage shows the strike off auger to right and in front. This is followed by the vibrator, 4 ft. long spinning rollers, a finish pan and a burlap drag. The rail and roller system is shown in the bottom foreground.

Slide 26. After placement, finishing, and surface texturing, the overlay is cured by a layer of wet burlap and a layer of polyethylene for 24 hours. A subsequent 72 hour dry cure period follows prior to allowing traffic on the bridge again.

Slide 27. A side-by-side performance after 7 years of air entrained concrete (left) and latex modified concrete (right). Notice the lack of surface deterioration on the modified concrete after 7 years of salt application and freeze-thaw exposure.

Slide 28. A developmental spin-off application—polymer portland cement shotcrete. A nine bag mix using the wet mix shotcrete process and concrete sand.

Slide 29. A True Gun-All wet mix mixer/gun. A dual chamber and self-loading skip.

Slide 30. Repairs were made to this bridge on the Rickenbacker Causeway, Miami, Florida, in 1975.

Slide 31. Typical deterioration of supports to bridges over salt water. Water splashes onto the piles, pile caps and beams. The salt and moisture penetration attacks the reinforcing steel and swelling products of corrosion forces cover concrete to fail.

Slide 32. Step number 1 in preparation is to hand-chip concrete away from the re-steel. Exposing all corroded surface area is necessary for coating the bar and reestablishing bond to the original concrete mass.

Slide 33. Sandblasting of the steel to white metal and the concrete to remove all laitance is next.

Slide 34. The properly prepared area looks like this. It was wetted down for 30 minutes prior to shotcreting. This prevents the substrate from drawing water out of the freshly deposited shotcrete and preventing proper bond development.

Slide 35. This area of repair was sprayed on in 1 to 1½ inch layers. Each layer was allowed to firm up prior to supporting the next layer. Cutting and troweling the overspray from the original beam surfaces allows the repair to grow out to its original shape.

Slide 36. This is the final appearance of this repaired area. The beam has regained its configuration.

Slide 37. This cavity and others like it could be formed.

Slide 38. Here the form is in place and the shotcrete has been carefully sprayed around the re-bar and troweled and finished in one operation. The form eliminated building-up in layers and any waiting in between.

Slide 39. With the form removed, both surfaces and the corner can be seen to be clean and even.

Slide 40. This is one pair of three, of bridges repaired at Daytona Beach in 1976. All equipment could be set up in the median as seen here.

Slide 41. Or as seen here, all equipment could be moved on the bridge in the morning and quickly off at night.

Slide 42. All the pile caps were deteriorated as this slide depicts. The cavities were 10-12 inches on each of the two faces with the re-bar being completely exposed.

Slide 43. The nozzlemen is spraying the first layer of 5 or 7 layers of this beam. He varies his spray direction around the re-bar to insure that he doesn't create a void or sand pocket behind the re-bar.

Slide 44. The repair has received several layers at this point and has been shaped as building-up has progressed.

Slide 45. The original beam configuration has been maintained, including the chamfer corner.

Slide 46. A close-up view of the beam's end, which has three repair planes intersecting. A flash coat over the surface hides trowel marks left from finishing.

Slide 47. (Blank)

Slides 48 to 53: The next few slides show typical cracks in piers, pedestals and "poured in place" concrete caps. (Osmose)

Slide 54. The first step in concrete restoration by the epoxy injection method is to make an analysis which includes test cores, sounding and probing of the cracks.

Slide 55. This test core shows the crack pattern. Notice the debris in the cracks.

Slide 56. After the test cores, the cracks to be repaired are defined.

Slide 57. Following this, holes are drilled, to be used for cleaning and for injection ports.

Slide 58. Surfaces adjacent to the cracks are sandblasted to provide a sound surface for the crack sealer.

Slide 59. Where mud and silt has been over the area to be repaired, or for other reasons, the cracks are cleaned.

Slide 60. Here the injection ports are being placed, after which:

Slide 61. The cracks are sealed with epoxy paste to later contain the injection epoxy within the structure and force it back into the inner areas.

Slide 62. This shows the mixing head and material hoses.

Slide 63. Under certain conditions, epoxy must be injected simultaneously from more than one location.

Slide 64. Injection is started at the bottom and as the epoxy comes out of the next higher hole, the bottom holes are sealed off and the injection proceeds upwards progressively. This is done to insure complete bonding of the cracks.

Slide 65. This shows the ports plugged after injection.

Slides 66 & 67. These two slides show a record core being taken, after the job is completed.

Slide 68. Here we have a typical record core, which confirms the epoxy penetration and the bonding of adjacent surfaces.

Slide 69. This concrete pile has an area in which the concrete has spalled off, exposing the reinforcing steel.

Slide 70. After repairs have been made with an epoxy-sand mixture, the concrete pile looks like this.

Tray 2—Turzillo
Repairs utilizing preplaced aggregate concrete

Slide 1. The first few slides show a bridge on a trunk-line railroad in Detroit: This photo shows the deteriorated concrete prior to surface preparation.

Slides 2-3. The deteriorated concrete must be removed to sound material, as shown in these photos.

Slide 4. Chipping and cleaning of the wing wall has been done prior to placement of reinforcing steel and forms.

Slide 5. Next—the forms are constructed and aggregates placed.

Slide 6. This view shows the pumping of Groutite Mortar in progress.

Slide 7. Pumping has been completed and the surface topped off with Groutite Mortar. Note batch plant on right of photo.

Slide 8. Here we have the completed wing wall which was restored by the P.A.C. method.

Slide 9. (Blank)

Mill Street bridge in Akron, Ohio:

Slide 10. This slide shows the spalling archway.

Slide 11. The surface was deteriorated at joints and columns, and . . .

Slide 12. Pneumatically applied mortar was spalling off.

Slide 13. The deteriorated concrete is removed to sound material.

Slide 14. An interior view of the repaired arch, utilizing P.A.C. method.

Slide 15. This is another view of the repaired arch.

Slide 16. Another concrete arch structure had severe deterioration.

Slide 17. Typical deterioration. Notice the re-bar was placed too close to the form area in the original construction.

Slide 18. Overhead arch of the existing bridge shows spalling of concrete and fractures.

Slide 19. The left-hand side of abutment and arch after repairs. Righthand side of photo shows area to be repaired.

Slide 20. This is a close-up view showing the bonding plane between conventional concrete and P.A.C. repair.

Slide 21. (Blank)

Slide 22. The Cherry Street Bridge in Toledo had deteriorated to the point where the deck had to be replaced. The stringer beams were in bad shape but could be repaired.

Slide 23. The deck has been replaced and part of the stringer beams have been restored. Notice the original condition of the stringers on the left and the rebuilt ones on the right.

Slide 24. (Blank)

Near Livermore, Ky. a railroad bridge had developed masonry problems:

Slide 25. This is one of the bridge piers showing cap concrete disintegration.

Slide 26. Stone masonry repairs were first made, utilizing pressure grouting techniques to consolidate the fractures in existing abutment pier prior to P.A.C. repairs.

Slide 27. After the deteriorated concrete was removed from the pier cap, forms were placed.

Slide 28. Then—washed aggregates are placed in the forms.

Slide 29. Here, the men are topping off the pier cap through injection of Groutite Mortar and solidification of the preplaced aggregates.

Slide 30. Upon completion of pumping Groutite Mortar into the aggregate, and—

Slide 31. Removal of forms—the cap looked like this.

Slide 32. This is another view of the pier cap with the repairs completed.

Slide 33. The damaged corner of a pier had to be shored up until sufficient repairs could be made.

Slide 34. This is the same area after P.A.C. repairs were made.

Slide 35. (Blank)

A terminal railroad over the Maumee River had suffered pier damage due to freezing and thawing and water action at the water line:

Slide 36. An overall view of the diving platforms, material storage and pumping equipment, at the job site.

Slide 37. The surface is being chipped down to sound concrete prior to installing of reinforcing steel and forms.

Slide 38. After the surface preparation is completed, reinforcing steel and forms are placed by diver.

Slide 39. This is a close-up of deteriorated concrete after removal to sound material with reinforcing steel and part of the forms in place. No dewatering of forms is necessary since Groutite Mortar displaces water.

Slide 40. A close-up view of pier prior to placing aggregates.

Slide 41. That portion of the pier from below the water line to above the high water mark has been repaired with P.A.C.

Slide 42. An overall view of the pier after repairs are completed.

Slide 43. (Blank)

Slide 44. This is a bridge near Clearwater, Idaho, in which the pier in the middle of the river was scoured out. This slide shows the access road being built into the work area.

Slide 45. Typical equipment used for fabricating on site special Bagpipe Groutainers to fit irregularities encountered by diver.

Slide 46. The mixing and pumping crew on shore delivering materials under pressure through grout lines, which are controlled by diver underwater.

Slide 47. Underwater repairs to the scoured-out bridge pier are being made, utilizing Bagpipe Groutainer system. A working platform for the diver, with emergency air supply within receiver, is mounted on barges.

Slide 48. Diving platform and diver, working on up-stream side of the pier nose.

Slide 49. Here the diver is at work, under water.

Slide 50. This picture shows placement of bag under scoured-out footing.

Slide 51. A close-up view underwater of base bag with sand and gravel, on irregular bottom. Upper portion, showing underside of scoured-out pier.

Slide 52. Another underwater picture showing built-up of base bags prior to placement of the final bags to underpin the scoured area.

Slide 53. Note the piece of iron and debris which had been left in the original construction. Photos show the last bag after pumping, which denotes how the bag has conformed to irregularities of underside of the footing.

Slide 54. Additional area of the pier, showing bags being multiply stacked to underside of scoured area.

Slide 55. These bags have been multiply stacked prior to placement of the last bag under the scoured area.

Slide 56. Photo showing the diver operating a jackhammer underwater.

Slide 57. Bags after being multiply stacked, were drilled underwater with a jackhammer and vertical reinforcing steel placed to act as shear keys.

Slide 58. (Blank)

A railroad bridge at Dodge Center, Minn. had a scoured-out pier:

Slide 59. This shows the repairs that were made by underpinning and encasement of the lower section of the pier by the Bagpipe method.

Slide 60. An end view of the pier showing the Groutainer encasement.

Slide 61. Here is another view showing the Groutite containers filling the void of the scoured out portion of the pier, and the encasement above the water-line. The crew are drilling and pumping grout into the masonry above to consolidate the remaining structure.

Slide 62. (Blank)

Tray 3—Penetryn

Epoxy repair of concrete structures by pressure injection

The following photos illustrate typical failures requiring injection of epoxy adhesive:

Slide 1. One year old waste water treatment plant was leaking water through cracks, developed probably from shrinkage of concrete.

Slide 2. A ten year old parking garage developed cracks in concrete roof slab allowing water leaking through to drip on parked cars.

Slide 3. Large drop forge machine started moving on foundation creating gap between foundation and machine legs.

Slife 4. Six month old waste water treatment plant's three sediment tanks created delamination between structural slab and floor surface grout.

Slide 5. Twenty-eight bridge piers developed cracks full depth approximately five feet from top of piers. Note special scaffolding required.

Slide 6. Ten year old parking garage developed cracks in beams as a result of water penetrating through floor slab cracks into beams, oxidizing reinforcing steel.

Slide 7. Lime silo of major oil company developed structural cracks allowing moisture and water to enter into lime storage.

Slide 8. Lock walls developed cracks allowing water to enter and freeze, causing failure of lock walls.

Slide 9. (Blank)

The next few slides show repair preparation:

Slide 10. Holes are cored into crack plane ½″ to 1″ in diameter and 1.5″ deep.

Slide 11. Injection port nipples are inserted into cored holes and anchored with a quick setting temporary grout seal.

Slide 12. Separation between machine

base and foundation is cored and injection port nipples are grouted into cored holes.

Slide 13. (Blank)

Repair application follows:

Slide 14. Injection machine and pressure gun, which is attached to injection port nipples.

Slide 15. Again, gun is attached to port nipple for machine grouting injection.

Slides 16-17-18-19. These slides show another method used, which involves holding the injection gun on the ½" diameter port hole. This method requires a rubber tip on injection gun nozzle for sealing nozzle against concrete surface.

Slide 20. Injection is started at one end of crack and gun is moved from one injection port nipple to other nipples along crack plane until injection material appears at each injection port nipple; then port nipple is sealed off.

Slide 21. After cracks have been injected, finishing is done by grinding of the temporary seal, leaving a clean, smooth surface.

Slide 22. Floor in Treatment Plant supporting heavy equipment developed crack failure soon after construction. Here, crack is sealed with epoxy gel. Note injection ports formed by narrow tape placed across crack at calculated intervals prior to sealing top of crack. The underside of the exposed crack has been completely sealed with gel.

Slides 23-24. Pressure injection of two-component epoxy through mixing head. This type machine allows in-line mixing of the two-component epoxy material within the injection gun. The machine will ratio the resin and hardener material automatically.

Pressure gauges allow monitoring of pressures during injection—up to 200 psi.

Slide 25. (Blank)

The following slides show a typical shotcrete restoration of a viaduct structure over yard office tracks. The structure had deteriorated to a condition which was hazardous to railroad personnel working below. Cause of deterioration could be attributed to a large extent upon drainage problems, deck deterioration and subsequent water and salt damage. In the absence of complete deck renewal, every effort was made to correct the causes of deterioration in the restoration of the structure. Drainage scuppers were cleaned or renewed and curb areas water-proofed and restored.

Slide 26. Airplaco cement gun and mixer-elevator.

Slide 27. Mixer with Reed Cement Gun. Typical equipment trailer in background.

Slides 28-29-30. Column Bents chipped and reinforced for shotcrete replacement material.

Slides 31-32-33. Column prepared for shotcrete.

Slide 34. Shotcreting column bent.

Slide 35. Preparing overhead surfaces.

Slide 36. Shotcreting crash wall.

Slide 37. Screeded shotcrete ready for float finish.

Slide 38. Floating shotcreted surfaces.

Slide 39. General view during execution.

Slide 40. View of completed restoration.

Slide 41. Deck curb area exposed for restoration and waterproffing.

Slide 42. Completed deck.

Slide 43. Completed column bent.

Slide 44. Elevation of typical span completed.

Slide 45. Overall view of completed structure.

Slide 46. (Blank)

Here we have a concrete railroad arch bridge. The arch was deteriorated and hazardous to pedestrian and road traffic. Head and wing walls required raising since the track had been continuously raised and the embankment slope changed. The following photos illustrate the restoration procedures.

Slide 47. Partially chipped arch. Form installed for headwall raise.

Slide 48. Chipping arch wing.

Slide 49. Wing wall chipped and ready for placement of reinforcing.

Slide 50. View from inside arch ring. Form installed at arch for maintaining contour.

Slide 51. Elevation — surfaces reinforced and ready for shotcrete.

Slide 52. Form for wing raise.

Slide 53. Shotcreting.

Slide 54. Completing restoration.

Miscellaneous Shotcrete Slides

Slides 55-59. Restoring and raising bridge facia curb.

Slides 60-63. Typical repairs to railroad bridge over highway.

Slide 64. (Blank)

Slide 65. ConRail Roseville Tunnel, Netcong, N.J. had leakage problems.

Slide 66. Gel injection system was used to provide a 15′ wide umbrella protection system over the track.

Slide 67. Notice the icicles at the sides but absence of them over the track section.

Slide 68. Another view of umbrella section protection.

Slide 69. A view of concrete section of the tunnel showing quickset shotcrete sealing the cracks. One of the panel members will more thoroughly describe how the work was done later.

Slide 70. (Blank)

This concludes the slide portion of this report.

If we may now have the lights on, please, we will have a panel presentation by the members of this Committee.

Shotcrete Repair of Concrete

By E. R. BLEWITT

Vice President, Penetryn System, Willoughby, Ohio

Introduction

For over 25 years I have had the interesting experience of examining defective or distressed concrete and masonry structures, primarily railroad oriented. Some of you more seasoned gentlemen may remember the large sign displayed by a cement company as you were welcomed to Chicago from the East with the slogan "Concrete for Permanence." Here is how Mr. Webster defines "Permanence":

> Permanence: Lasting or intended to last indefinitely without change; continuing in the same state or in the same place; stable, durable, not subject to obliteration or removal.

Unfortunately, the sign was fabricated from something other than concrete and has long since deteriorated and is no longer theme.

That sign perhaps overstated a case, but without question, concrete has been the foremost building material for structures since the turn of the century, and has contributed tremendously to the construction industry.

We will not argue permanence, however, rather we shall state categorically that for reasons sometimes obvious and other reasons not so obvious, concrete *does* deteriorate, concrete *does* fail and concrete does require periodic maintenance if structural permanency is to be maintained.

Analysis of structure

Railroad structures—bridges and tunnels are unique in many respects. For the most part, they were constructed over a relatively short span of time. Many of the concrete structures are unreinforced gravity sections and, because the railroads at the time were prosperous, most are well designed and well constructed, consistent with the best technology and finest materials available during the period. Truly, they were constructed with permanence in mind.

However, time and progress do not stand still. The effects of increased track loadings, raising of track elevation due to track maintenance, changes in stream flows and elevations and many other factors all contribute to structural defects and deterioration.

Therefore, the first step in structural rehabilitation *must* be an analysis of the problem and cognizance of changing conditions. Often the defect is obvious and the obvious answer is to fix it. To restore the structure to the original design is a temptation one must resist by simply stopping and saying "Why." Why did the structure deteriorate? Why did the footer undermine? Why did the wing crack? In some instances we know the answer before we ask, but asking oneself anyway may bring to light a secondary, not so obvious, answer that may be the real reason you are looking for.

Correction

Having made an analysis of the causes, the methods of repair should be considered with correction in mind to alleviate the reason for failure if at all possible. If the unreinforced back wall is cracked or shows signs of movement, often long vertical dowels or anchor rods will restore its integrity and will withstand the increased loading encountered. If the structure is deteriorating due to moisture problems, drainage may be corrected . . . new weeps installed and old weeps cleaned. If the footer is undermined or timber matting exposed due to lowering of the stream by local authorities, driving light sheeting with concrete capping may eliminate the need for underpinning. If culvert wings are undermined, simple sheet piling cut-off walls will often solve the problem, and so on. In other words, utilization of *all* construction techniques should be considered in a corrective structural rehabilitation.

Mr. Bryant showed you a number of slides depicting some of Penetryn efforts in shotcreting and epoxy injection. Fortunately, we are not restricted to these two techniques of restoration. As engineers and bridge and tunnel-repair specialists, we are able to utilize whatever technique is required to achieve an economical lasting repair. The older techniques of reinforced poured concreting, grouting and shotcreting have a well earned reputation when properly executed, and may be combined together and with new techniques and materials such as epoxies, chemical grouts, and others to good advantage.

The importance of workmanship, however, cannot be over-emphasized. *No matter what technique or material is utilized, the ultimate result will depend overwhelmingly upon the way the job is done, not upon the method used.*

Shotcrete

An example of this may well be illustrated by the Shotcrete method. Since the Shotcrete method has been utilized for many years, most engineers are familiar with the general procedures involved in a standard concrete repair project. However, some have given too little attention to the quality of the work, misused the application for it, and have become disenchanted with the results. Shotcrete is an excellent method to be utilized with a properly engineered repair project. But it is not a method in itself; it is only a term designating the means of application of the replacement material and constitutes a small percentage of a complete restoration project.

Concrete removal

"Concrete Dentistry" is a term sometimes associated with concrete repair by the Shotcrete method. As in Dentistry, it is of prime importance to prepare the structure properly before filling—sometimes it hurts too, because preparation done properly is time consuming and costly. Nevertheless, all decay and deterioration *must* be removed to sound material if the filling is to be permanent and the integrity of the structure restored. Proper removal is by far the most important operation in a repair project and particular care must be exercised in this phase of the work.

Cracks and Joints

The treatment of cracks is a subject in itself. The preparation and method of crack repair will vary depending upon the diagnosed cause of the failure and judgment as to whether there is movement at the location of the crack separation. In the treatment of cracks, as you have seen in the slides, epoxy injection has become an important and useful tool in restoration.

Reinforcement

In general, all shotcrete should be reinforced in accordance with AREA Specifications. The versatility of shotcrete repair also enables the installation of additional or special reinforcement at critical locations where distress is evident or the existing design is inadequate for changing conditions.

Placing

The proper placement of the shotcrete depends to a large extent upon the skills of the nozzle and gun operators. The nozzle operator is of prime importance to the integrity and quality of the shotcrete, and should be thoroughly trained in the techniques of application.

Summary

Shotcrete is a useful and practical method of concrete restoration. It is a proven method that is highly versatile and can be utilized to advantage as a valuable tool in structural repair. However, it is *not* an entity in itself.

An effective shotcrete-repair project depends greatly upon the excellence of workmanship in all phases of the work, including surface preparation, reinforcement, placement, curing, and corrective measures which must be considered a part of the restoration repair.

After 25 years of examining a multitude of problem structures, I sometimes think I've seen every possible situation that exists or could exist. The challenge of tomorrow will again prove I haven't . . . and that's what makes life so interesting.

Using Epoxies In Concrete Repair

By T. J. CHRISTENSON

Engineer - Structures Repair, Osmose Railroad Division

T. J. Christenson

Epoxy injection of cracked concrete can restore fully the structural integrity of cracked concrete members. The reasons that epoxies work so well for restoring cracked concrete are:

They are 100% solids in the liquid form. This may seem somewhat confusing, but actually the material starts out as a liquid and everything that you pump into the concrete turns into a solid. No gases are given off during this transformation, and almost zero shrinkage takes place upon this curing. The strength of the epoxies themselves are in excess of those of the concrete. Most epoxies that we use have compression strengths in the neighborhood of 12,000 psi, and tensile strength in the neighborhood of 8,000 psi.

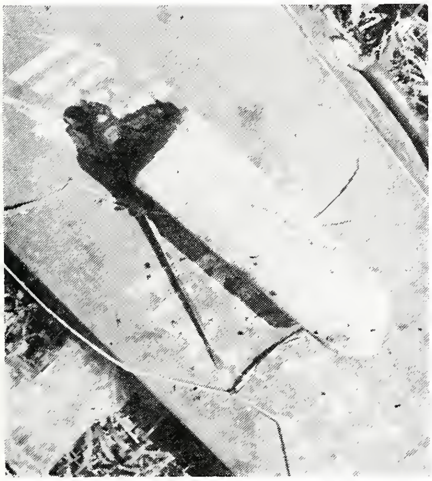
Epoxies have been in existence for many years. Over the years they have been used by untrained people for many situations, and in some of these situations they were not properly applied, or proper formulations were not used. This resulted in the expected—which was unsatisfactory repair work. We use specially trained crews for epoxy work, and they do nothing but epoxy repairs every day.

The actual repair work done on concrete substructures of railroad bridges consists of basically seven steps. The first being a detailed analysis of the crack system. This includes sounding of the concrete member, probing and also extracting test cores out of the concrete member. From this analysis, the crack system can be defined and the repair methods determined.

The cleaning of the crack substrates is of the utmost importance. If the surfaces of the concrete cracks are not properly cleaned, a satisfactory bond cannot be obtained using epoxies. Much experience and know-how is necessary to satisfactorily clean the cracks of longstanding on railroad substructures. To accomplish the actual cleaning, a variety of cleaning methods are employed. In some cases compressed air will remove the debris. In other cases, high pressure liquid solvents must be employed. In severe cleaning problems an acid etching may be necessary. This of course is always followed by complete neutralization with copious quantities of fresh clean water. This cleaning operation must be monitored by taking additional cores to confirm the cleanliness. Once the cracks have been adequately cleaned, holes are drilled into the crack system to facilitate injection of the epoxy formulation. These holes are approximately 3/8″ in diameter and 1/4″ in depth ,and are located at strategic intervals along the crack and at crack intersections .

The cracks are then sealed at the surface with a high strength epoxy paste, and the injection ports are firmly affixed into the pre-drilled holes. This opera-

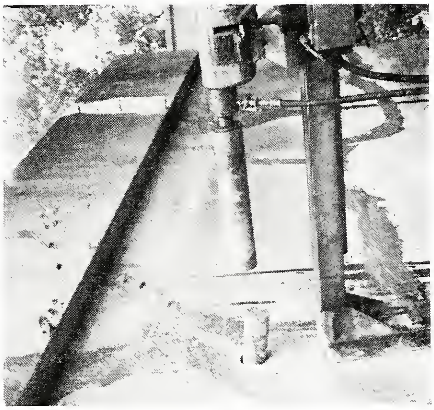
INJECTION of epoxy under controlled pressure.



TYPICAL record core. Note repaired crack.

tion is one of the most important steps in the repair procedure. Without adequate sealing at the surface, injection pressures will not be maintained to guarantee full depth penetration in concrete members of large size.

Once the surface sealant material has cured, injection can begin. The proper epoxy formulation is chosen. The formulation is matched to the specific requirements of the job. The crack sizes must be considered along with the ambient temperature and modulus requirements.



EXTRACTING a record core after repairs are completed.

Our formulations of epoxy are hydrophilic. In other words, they are water-loving so to say, and they will actually bond to a wet surface. Successful repair of cracked concrete can even be done under salt water or fresh water.

The actual injection is done using an automatic mixing and dispensing pump which automatically ratios the material and pumps the material through mixing devices and into the injection ports. Injection begins at the lowest port and proceeds upward. This insures complete filling of the crack system by always working toward a vent. This allows for air to be displaced and vented to the outside. As the injection continues, epoxy appears at the adjacent ports at which time the ports are plugged, or the injection nozzle is moved to the adjacent port and the first port is plugged. This same procedure is continued until the complete crack system is filled.

In many cases on railroad substructures where the crack system extends completely through the member—this could be 6 to 10 ft. thick concrete piers, normally unreinforced, we have actually pumped epoxy completely through fine crack systems for a depth of up to 6 to 8 ft.

After injection is completed the ports are removed back flush with the concrete surface. Final record cores are extracted from the structure. These cores confirm penetration and bonding of the crack system. A smapling of these record cores are then subjected to compressive tests by engineering laboratories. A final report then is prepared for the owner's record. The laboratory test reports are included, and in all cases the strength of the epoxy repaired concrete equals or exceeds the strength of the parent concrete. There are some sample records cores up here on the table for anyone to review, if you desire.

New Techniques for Concrete Repair

By ARTHUR PIEPMEIER

Vice President, Turner Engineering Co., Nashville, Tenn.

Railroad design and construction, and grandchildren are my two favorite subjects. The other panel members have talked about two techniques in concrete restoration, so I probably should comment on rearing grandchildren.

We used old methods in rearing our children. We used the saying, "Spare the rod and spoil the child." Now our grandchildren are being brought up using new techniques, and I'm not sure we understand these new techniques. However, both techniques, old and new, work but both still have problems. Our problem is to improve our chances of getting good results. Concrete restoration is somewhat the same. Some old methods worked, but some new techniques are better.

(1) Bridge seats

Concrete has been used for several years now. In a flea market in Nashville, I found an old copy of the 1911 AREA Manual, and in Chapter 8 under "Concrete Bridge Seats" I read this: "Concrete, either plain or reinforced, is suitable for bridge seats and pedestal caps." Period. That's all it said. Many bridge seats built in 1911 are now being repaired, but 65 years is a pretty good life for these old methods.

One method used in repairing bridge seats is as follows: (1) drill holes in the bridge seat and insert reinforcing bars; (2) remove approximately one-third of the bridge seat from under the masonry plate; and, (3) replace that portion with shotcrete or with quality concrete. After the first portion has attained a working strength, another portion is cut out and replaced with new material. This is done in sequence until the bridge seat is repaired. Many of you have used this method, and I'm sure you can offer comments or modifications.

(2) Salt on bridge decks

Salt used for ice removal on bridges causes considerable damage to concrete decks. In some cases where salt has been used with heavy traffic, the deck has disintegrated within three years. There are coatings available that can protect concrete decks, but they must be applied frequently. One method is to coat the concrete deck each fall (every year) with boiled linseed oil. This seals the pores and prolongs the life when exposed to salt. Several highway departments use this technique as it is inexpensive and effective.

(3) Asphalt paving on bridge decks

Many concrete decks on overhead bridges have been paved over with an asphalt (hot mix) for wearing surface and, supposedly, a seal to protect the concrete. In repairing these structures, it has been found that this asphalt actually allows salt to soak through the paving and be retained, with moisture, on the concrete deck. This speeds up the concrete-deck deterioration. This asphalt frequently does more harm than good. To repair these decks, it is sometimes advisable to remove the asphalt paving, cut out the deteriorated concrete, and replace it with epoxy and concrete. The Standard Engineering Corporation of Albany, New York has done much of this type of work. A polymer concrete surface can be used and it stands up better than plain or air entrained concrete. However, after it is repaired, it is advisable to leave the asphalt paving off the concrete decks.

(4) Tunnels

There have been many uses for concrete over the years, and it is surprising how well much of it has stood the test of time. It is also surprising sometimes how well our children and grandchildren grow up in spite of what we do for them. However, failures have occurred in tunnels caused by the shifting or settlement of the tunnel cover or base or by continuous ground water seepage through the cover. This causes leaking onto tracks.

The Roseville Tunnel, now owned by ConRail (formerly Erie Lackawanna) was repaired by The Penetryn System of Willoughby, Ohia as seen on the slides. It had leaks over the tracks. This caused icicles in the winter, creating a hazard to rolling stock, and fouling the track and ballast in the summer.

The method used in the repairs was as follows:

A. Holes were drilled at areas of leakage to relieve water pressure, primarily overhead.

B. Temporary rubber nipples were set in the drilled holes.

C. The surfaces were cleaned by high pressure sandblasting.

D. The exposed areas of seepage were sealed with a quick setting waterproof cement-sand shotcrete.

E. The temporary nipples, previously set in the drilled holes, were removed and packers inserted for the chemical grout.

F. The holes were pressure-injected with quick-setting chemical grout (in this case, Injectite-Q). This provided an effective waterproof "umbrella" over the tracks. No attempt was made to seal the tunnel completely but just over the tracks. This proved to be an effective repair job. In our field we use the term "cost effective."

(5) Sewers

Many sewers are made of concrete pipe. In the case of leaking or infiltration in a sewer, repairs can be made with chemical grout. This is done by using internal equipment, such as packers designed for this purpose and pulled through the pipe. The packer is located adjacent to the leak, and chemical grout is forced from the packer into the leak. The grout sets up in seconds or minutes as determined by the grout mix. A TV camera is pulled through the line to observe the repairs. This method works quite well even though the grout has little strength and depends on the existing pipe or adjacent material for support. Our firm, Turner Engineering Company, has used The Penetryn System for much of this type of sewer repairs with good results.

(6) Supervision

The largest single problem in concrete restoration is the lack of proper supervision during repairs. Many times plans, mixes and techniques are prepared in detail yet the repairs do not last or are not done properly. Frequently there is a lack of communication and understanding between designer and repair crew as to why the specified techniques are necessary.

During extensive repairs, it is important to have a competent inspector on the job who understands the problem.

We have found the following very effective in obtaining good restoration work:

A. Have a pre-bid conference if it is contract work so the contractor knows what he is bidding.
C. Have a pre-construction conference before work begins, whether it is a contractor or railroad crew so the work force knows what is expected of them—review plans and specifications and answer questions.
C. Have periodic inspections for payment or progress which helps determine if the work is being done properly.
D. Have a final inspection and let the work crew know there will be a final inspection. This is an important part of supervision.

Following are a few places where major problems occur in concrete restoration:

A. The work crew is not experienced in the type of repairs they are doing. Sometimes the crew has never done a similar job.
B. Some of the old concrete is not removed. Sometimes it is coated over.
C. The mix or material is not proper for the job. It sometimes is too wet or dry.
D. Proper curing is not maintained. Sometimes it is left from Friday afternoon until Monday with no curing.

The main reason that shotcrete is not used more is the poor examples available on some repaired structures. Shotcrete is a good method of repair when properly done.

Concrete as a construction material may be here for a long time and, until we find a better material, let's keep concrete repaired.

Bridge Pier Repair Methods

By STEPHEN A. MAREK

Vice President, Lee Turzillo Contracting Company

I would like to talk about two methods of concrete restoration: One is Preplaced Aggregate Concrete (PAC) and the other is BAGPIPE® grouting.

First, let's consider concrete repair using PAC, a method for making concrete by pumping a properly designed cement-sand Groutite^{TM} mortar with special additives into carefully graded coarse aggregate previously placed in the forms. PAC is not new, but it is the best procedure that I have come across in the 17 years that I have been making structural concrete repairs and additions, both above and under water. PAC has been used extensively by the railroad industry in the USA and Canada for more than 40 years.

A typical application is that of replacing a section of deteriorated concrete in a bridge pier or abutment. The first step is to remove all unsound and disintegrated material back to sound concrete, leaving squared edges. Next, the rough concrete surface is thoroughly washed and badly rusted steel reinforcement replaced. Forms are then set and filled with washed, properly graded coarse aggregate. If the placement is open at the top, vertical grout injection pipes and sounding wells are set before or during aggregate placement. If the placement is in a closed form, as is usually the situation when the repair is on a vertical surface, injection holes are drilled through the face of the forms at proper spacing. When the forms have been completely filled with coarse aggregate, Groutite mortar is injected into the voids in the coarse aggregate mass at controlled pressure, starting at the bottom. This mortar is so fluid that it will move both laterally and vertically through the voids to consolidate the preplaced aggregate into first-class concrete. Where loading and maintenance of traffic require, repair placements can easily be made in sections.

Good bond with old concrete

What are the advantages of using PAC? The bond of PAC to old concrete is unusually good because the Groutite mortar pumped into the preplaced aggregate also penetrates the small voids in the rough surface of the base concrete to establish a superior mechanical connection. Then because the preplaced aggregate particles are in point-to-point contact, later drying shrinkage in the added PAC is reduced to less than half that which occurs in ordinary concrete. By actual test, the bond of PAC to roughened old concrete is better than 85% of the monolithic strength of the older concrete. Most tests on cores drilled through PAC into the original concrete show 100% bond—the cores break in the old concrete, not at the contact surface.

Durability is excellent. Why? Each cubic yard of PAC contains 27 cubic feet of coarse aggregate. Ordinary concrete contains only about 18 cubic feet of coarse aggregate because the pieces of stone have to be floated in a mortar matrix to provide plasticity for placement. Good aggregate doesn't break down during freezing and thawing and Groutite mortar is air-entrained to provide space into which ice crystals can expand instead of rupturing the mortar.

Another advantage of PAC is its resistance to erosion. Stone (coarse aggregate) is the strongest component of concrete and, as just mentioned, PAC contains 50% more stone or coarse aggregate than ordinary concrete. PAC, therefore, will withstand abrasion by sand and gravel carried along the streambed and by logs or whatever is floating by. When the durability characteristics of the wearing surface are improved, maintenance is obviously minimized. Thus, a PAC repair is armoured against a repetition of deterioration. If the pier is built with PAC in the first place, or completely encased in PAC, it will be a long, long time before anyone has to think about how it is withstanding weather and erosion.

Another point to consider is the fact that 50 to 60% of PAC is coarse aggregate, an inert material that is not affected by slow or interrupted placement. Hence, it can be deposited in lifts in awkward or complicated placements as reinforcement is set and forms are erected. Later, the Groutite mortar is mixed in a convenient location and pumped to the forms through an easily handled hose to produce a monolithic mass of any height (up to several hundred feet, if desired).

Furthermore, because only 40 to 50% of the total concrete—the Groutite mortar—has to be mixed and handled, the equipment for doing this is much smaller than that required for conventional concrete. This makes for reduced on-site space requirements and easier on-site mixing in quantities as needed for the work.

The Bagpipe grouting system

The second bridge pier repair method I would like to discuss involves the use of Flexmat, Flexform and Groutainer flexible forms. These are developments of Lee Turzillo based on the Bagpipe grouting system which he inverted and patented in the early 60's. As a group, they are effective both above and below water for encasing and/or underpinning piers, abutments, culvert aprons, wing walls, diversion walls, etc., and for embankment protection and stabilization. Potential applications are numerous because of the great flexibility of the Bagpipe system; its speed of application, minimal equipment requirements and the fact that the system allows concrete placement in moving water.

You may be familiar with the Groutainer, a specially woven cloth bag inflated in place with Groutite mortar. Groutainer forms may be fabricated at the site to meet requirements when the dimensions of the problem area are unknown, as is often the case with underpinning, or prefabricated for embankment protection or cofferdams. Groutainer forms are used either singly or stacked and may be reinforced internally with wire mesh or reinforcing steel, as well as being dowelled together or to the foundation.

Flexmat lining forms are similar to Groutainers but are shaped to lay flat over a wide area such as a sloping river bank to protect it against scour, erosion and water action. The thickness of the lining, after filling with Groutite mortar, normally averages 4" but may be adjusted to meet specific job requirements or field conditions.

The Flexform system uses a single layer of fabric draped inside an open matrix means supported in turn by vertical or horizontal reinforcement. Used instead of wood or steel forms, Flexform material seals easily to irregular surfaces making it ideal for encasing bridge piers or adding concrete to uneven as well as smooth surfaces.

Returning to the Bagpipe Groutainer system, the following is a brief description of how Groutainer forms are used underwater to underpin an undercut pier.

First, an experienced diver goes down, inspects the area, notifies his tender of the actual size of the void or voids he has observed and cleans the area of mud and debris. The work crew fabricates the Groutainer forms approximately 10% larger than the dimensions given by the diver. The flexible form with grout line attached is then lowered and placed in the voids by the diver who then directs the pumping. As the mortar is injected, the Groutainer form expands, taking the shape of the space into which it has been placed. The Groutainer fabric is porous to permit a small amount of mortar to ooze through upon final light pressuring. This oozed mortar provides bond to the boundaries, whether they be concrete, timber or adjacent inflated Groutainer bags. Groutainers may be doweled together or anchored to surroundings by passing rebars through them.

Flexmat mattresses or additional Groutainer bags are usually placed on the river bottom around a pier after it has been underpinned to prevent scour from recurring beneath the new underpinning.

Has inherent advantages

The advantages of using Groutainer bags and/or Flexmat and Flexform procedures for repairing bridge piers are numerous. Wood and steel forms are eliminated, reducing cost for materials and both labor and time for placement. The need for heavy equipment, access roads and working/storage areas is minimized. Since the work can be performed underwater, cofferdams are generally not required; steel sheet piling and costly dewatering systems operating 24 hours a day are also not needed. Avoiding dewatering, which can remove fines from under a structure, reduces the risk of additional settlement before underpinning is in place. By utilizing the time saving made possible through the use of flexible Groutainer bags placed and inflated under water with Groutite mortar, we have, in emergencies, actually started supporting dangerously undercut piers the same day the call was received.

Groutainer bags are also useful for river bank and lake shore stabilization as well as for protecting bridge piers. Most engineers know that where severe current or wave action occurs, rip-rap may be dislodged. One Bagpipe Groutainer, 40′ long, 10′ wide and 2′ thick will weigh over 100,000 lbs. This will not be removed by wave action, propeller wash, strong currents or most storms. We have placed Groutainer protective walls that have withstood hurricanes.

Where a river bank or reservoir shoreline needs protection from erosion by running water or mild waves, including wash from river craft, the Flexmat system is ideal. When laid in position, keyed to the bank surface and inflated with mortar, the Flexmat lining provides a concrete blanket in complete contact with the underlying material. Divers are only needed when the lining is continued into deep water. Drainage through Flexmat lining to prevent uplift where the water level is likely to drop rapidly is easily provided.

In summary, Bagpipe Groutainer, Flexmat and Flexform grout and concrete forming systems are very useful tools for repairing and stabilizing bridge piers and abutments.

Underwater placement eliminates the need for cofferdams and dewatering while flexible forming removes the normal requirement for tailoring forms of rigid materials to irregular surfaces. Equipment needs with attendant site preparation and access problems are minimal. All this makes for economy and speed, something we are all looking for in construction.

President Williams: Thank you Mr. Bryant and the members of your panel. We sincerely appreciate the leaders in the Concrete Restoration Industry taking the time from their busy schedules to address our Association.

This concludes our meeting for today. I hope to see you all at the REMSA Banquet tonight. We will convene in Regency Room A tomorrow morning at 9:30 a.m. Meeting is adjourned. (Gavel).

MORNING SESSION

September 15, 1976

President Williams: The Meeting will come to order.

Good morning members and guests. Welcome to the closing session of our 81st Annual Convention.

We will now begin our Business Session. Will the Officers and Directors of the Association please come forward.

The reports you will hear will provide you with information concerning the Business affairs of our Association. If you have a question regarding a specific report, please delay your inquiry until all reports have been presented. We will then attempt to answer any questions you may have.

On Monday morning during the introduction of our Officers and Directors, Mrs. Ann Wilson, our Secretary, was unable to be present. It is therefore a great pleasure to present her at this time.

Mrs. Wilson will you please present your report.

Secretary's Report

Report of Membership for Period September 8, 1975 to September 1, 1976

ACTIVE MEMBERSHIP			
Total Active Members September 8, 1975		425	
New Active Members since September 8, 1975		42	
Reinstated—Paid back dues		2	
		469	
LESS: Resigned account retirement	13		
Transferred to Life	11		
Deceased	2		
Dropped for non-payment of dues	27	53	
TOTAL ACTIVE MEMBERS			416
ASSOCIATE MEMBERS			
Total Associate Members September 8, 1975		85	
New Associate Members since September 8, 1975		16	
LESS: Resigned account retirement	3		
Transferred to Life	1		
Dropped for non-payment of dues	3	7	
TOTAL ASSOCIATE MEMBERS			94
LIFE MEMBERS			
Total Life Members September 8, 1975		153	
Transferred from Active Membership		11	
Transferred from Associate Membership		1	
LESS: Report deceased		10	
TOTAL LIFE MEMBERS			155
HONORARY MEMBERS			
Total Honorary Members September 8, 1975		9	
TOTAL HONORARY MEMBERS			9
TOTAL MEMBERSHIP ALL CLASSES—September 1, 1976			674

President Williams: Mr. Huffman will you please present the Treasurer's Report.

Treasurer's Report

Period September 1, 1975 to August 31, 1976

Checking Account balance August 31, 1975		$ 6,870.72
RECEIPTS		
Dues	$ 3,725.00	
1974 Advertising	465.00	
1975 Advertising	14,233.00	
Miscellaneous	14.00	18,437.00
		25,307.72
DISBURSEMENTS		
Salaries (Secretary & Assistant)	3,595.20	
FICA (On payroll)	210.28	
Office Rent, Telephone, Etc.	573.72	
Stationary & Printing	693.15	
Postage	481.67	
Office Supplies	307.44	
1974 Advertising (The American Pub. Co.)	597.41	
1975 Convention Expense	413.08	

State of Illinois Unemployment Tax	1.88	
Federal Unemployment Tax	8.82	
1975 Proceedings	4,137.21	
Executive Board Meetings	369.67	
1975 Advertising (American Pub. Co.)	4,513.89	
Membership Certificates	158.79	
Contributions	300.00	
Transfer of funds to Savings Account	3,000.00	
1976 Convention	174.54	
Miscellaneous	126.98	19,663.73
Checking Account Balance August 31, 1976		$ 5,643.99
Homewood Federal S/L Assn. 5¼%)		3,204.73
Homewood Federal S/L Assn. (6¾% 2/29/78)		6,040.45
Homewood Federal S/L Assn. (6¾% 8/2/77)		2,340.94
Homewood Federal S/L Assn. (6¾% 6/22/78)		3,109.94
		$ 20,340.05

President Williams: Thank you Mr. Huffman. It's nice to know we are in a sound financial condition. Mr. Lucas, a member of the Auditing Committee, will now present the results of the audit by his Committee.

Report of Auditing Committee

TO MEMBERS OF THE AMERICAN
RAILWAY BRIDGE & BUILDING ASSOCIATION

Gentlemen:

The undersigned have examined the books of the Secretary and report of the Treasurer for the period from September 1, 1975 to August 31, 1976 inclusive, and have found them to be correct as of the latter date.

Respectfully submitted,
E. R. SCHLAF, Chairman

President Williams: You have heard the reports of our Secretary, Treasurer, and Auditing Committee. Is there any discussion regarding these reports. If not, I will entertain a motion that the reports be accepted as given.—Is there a second? It has been moved and seconded that the reports be accepted. All in favor Aye—opposed No. The motion is carried and the reports are accepted.

Will Mr. Sturm of the Resolutions Committee now give its report.

Report of Resolutions Committee

Mr. President, at the close of this 81st Annual Convention of the American Railway Bridge and Building Association, the Resolutions Committee offers the following resolutions:

BE IT HEREBY RESOLVED that the thanks of the Association be extended to Leroy Cronkhite II, Pastor, Central Church of Chicago for his message of spiritual assurance.

BE IT FURTHER RESOLVED that the thanks of the Association be extended to the prominent speakers who gave of their time and so capably shared their wisdom and experience with us, especially Mr. John Fox, AREA president; Mr. John W. Ingram, president and chief operating officer, Rock Island; Mr. Bruce Flohr, deputy administrator, Federal Railroad Administration, Department of Transportation; Mr. G. W. McDonald, division engineer, Union Pacific; Mr. D. R. York, environmental engineer, Chicago and Northwestern; Mr. F. B. Lindsay, general bridge supervisor, Southern; Mr. R. J. Hansen, vice president, Canadian National; Dr. Carl S. Winters; K. T. Sawyer, Major General, retired, Federal Railroad Administration; Mr. Harris T. Remley, supervisor civic affairs, Seaboard Coast Line; Mr. Robert L. Cragg, president, the Earle Gear and Machine Co.; Mr. Richard Hale, architect, Santa Fe; Mr. D. L. Monson, resident engineer, Union Pacific; Mr. A. R. Dahlberg, assistant engineer, Santa Fe; Mr. L. E. Martin, president, Railway Engineering-Maintenance Suppliers Association and to all members of the Railway Engineering-Maintenance Suppliers Association for the fine banquet and entertainment which we enjoyed last evening.

BE IT FURTHER RESOLVED that our thanks be expressed to Mrs. W. H. Rankin and Mrs. R. E. Dennis and their committees for their efforts in arranging registration and entertainment for our wives, and to the untiring efforts of the ladies who assisted as hostesses.

AND, BE IT FINALLY RESOLVED that the Association express its thanks to its Chairmen and their committees for their excellent work in preparing the reports which were presented at the convention; also to the Chicago, Rock Island and Pacific Railroad, the Atchison, Topeka and Santa Fe, the Chicago, and Northwestern Transportation Company, and the Chicago, Milwaukee, St. Paul and Pacific Railroad who provided assistance at the registration desk, to the management and staff of the Hyatt Regency Chicago for their cooperation and hospitality, as well as to the members of our Executive Committee and to our President, J. R. Williams, who has spent so much of his own personal time and effort in guiding the affairs of the Association over the past year.

Mr. President, we recommend these resolutions be made a part of the official record of this Association.

Respectfully submitted,
W. C. Sturm, Chairman
Resolutions Committee

President Williams: Thank you Mr. Sturm. Will Mr. Lindsay of the Necrology Committee please present their report.

Report of Necrology Committee

To the President and Members of the
AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION:

It is with grief and regret that we report the known loss of twelve (12) members through death during the past year. It is possible that other members have passed away during the year of whom we have no information. If you know of any, please report their names to the Secretary. The following have been reported since our last Annual Meeting in September 1975.

Active Members	**Title — Railroad — Location**	**Joined**	**Deceased**
E. J. Hynes	Engr. B.&B. Detroit, Toledo & Ironton Dearborn, Mich.	1958	1975
M. S. Nelson	B.&B. Supvr Penn Central Trans Co. Perrysburg, Ohio	1956	1975

Life Members	*Title — Railroad — Location*	*Joined*	*Deceased*
R. C. Baker	Asst. Ch. Engr. Chicago & Eastern Illinois Danville, Ill.	1940	1976
O. C. Benson	Director Budgets Boston & Maine R.R. Concord, N.H.	1952	1975
E. D. Billmeyer	Asst. to Ch. Engineer-Struc. Western Maryland Randallstown, Md.	1955	1976
E. N. Budzenski	General Foreman Chicago & North Western Trans. Co. Antigo, Wis.	1938	1976
R. H. Carpenter	Engineer Maintenance of Way Missouri Pacific Monroe, La.	1956	1976
J. C. Crane	Asst. B.&B. Supvr. Southern Pacific Trans. Co. Forest Grove, Ore.	1957	1976
H. C. Fronabarger	B.&B. Supvr. Texas & Pacific Duncan, Okla.	1949	1975
B. Hemstad	Master Carpenter Great Northern Ry. Willmar, Minn.	1937	1976
N. F. Podas	Chief Engineer Minnesota Transfer Ry. Co. Burnsville, Minn.	1937	1974
C. E. Smith	Vice Pres. New York, New Haven & Hartford New Haven, Conn.	1911	1976

Respectfully submitted,
F. B. Lindsay, Chairman

President Williams: Thank you Mr. Lindsay. In remembrance of these members, let us stand in a moment of silence. (All stand)

Mr. J. C. Hobbs, our Second Vice President, is now granted the rostrum to propose an Amendment to our By-Laws.

Proposed Amendment To Constitution

ARTICLE III Membership

Section 1. The membership of this association shall be divided into four classes, viz: Members, life members, associate members and honorary members

Section 2. A member shall be a person in a position above rank of gang foreman in connection with engineering, construction and maintenance for railway bridges, buildings and water service facilities: or in the employ of a public regulatory, a professor of engineering or architecture, a technical editor, a government or private timber expert, a consulting engineer, or an engineer in his employ, engaged in the engineering, construction and maintenance of railroad-related facilities or an engineer employed by a technical service or research and development organization, an officer or engineer of an engineering or scientific society or association whose aims and objectives are compatible with the aims and objectives of this association. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance

Sections 3, 4, 5, 7, 8 will remain the same

Section 6 will be deleted

Delete word "Active" in all paragraphs

Mr. Hobbs: Mr. President, I move that this Amendment be adopted.

President Williams: You have heard the motion. Is there a second? All in favor of this Amendment say "Aye." The motion is carried.

Is there any new business to be brought before this meeting?

Award Honorary Membership

N. D. Bryant: The Special Committee on Honorary Membership presents the name of E. R. Schlaf for Honorary Membership.

President Williams: Our Constitution specifies that elevation to Honorary Membership be by vote of the membership at a regular meeting. Mr. Schlaf, one of our Past Presidents, has been nominated. We will now vote on this. All in favor—Aye (Pause). All opposed, No (Pause). Mr. Schlaf, I would like to present you with this Certificate of Honorary Membership and thank you on behalf of the Association for your many years of service.

Is there any further business? If not, the Business Session is adjourned and the Officers and Directors are excused.

Mr. Rankin, will you please introduce the next speaker?

Introduction of David L. Monson

W. H. Rankin: Our next featured speaker was born April 2nd, 1940. He attended Omaha University in Omaha, Nebraska. His engineering career was started with the Department of Roads for the state of Nebraska. He started his railroad service in 1964 as a rodman with the Union Pacific. He advanced to the positions of instrumentman and asst. engineer while working in the Omaha area which was involved in a growing industrial development. He then moved into Kansas to work on a line-change project. In 1972, he was promoted to project engineer in charge of construction of their Omaha Yard. In 1973, he was transferred to another large railroad construction project in Salt Lake City. In 1974, he was promoted to resident engineer in charge of the project which is the subject of his presentation. He is presently located at Hermiston, Oregon and is resident engineer for the Union Pacific's new classification yard at Hinkle, Oregon. He is a member of AREA. With pleasure I present to you Mr. David L. Monson, who will bring us an illustrated presentation on lowering their Aspen Tunnel.

How We Lowered the Aspen Tunnel

By D. L. MONSON

Resident Engineer, UP, Hermiston, Ore.

Mr. President, Vice President, Speakers, Members and Guests:

My slide presentation will be a brief history of the original construction of the Aspen Tunnel in Western Wyoming and the construction done in 1974 and 1975, as shown on the program, to lower the tunnel floor approximately six feet.

I do have some slides from 1901 that I have intermingled to show three-fourths of a century ago against present construction.

(Slide 1) The original line change in 1901 cut-off 9.56 miles and reduced the grade by .48% or 25.3 feet in elevation per mile. When the line change was made in 1901, it left several towns abandoned and there is one ghost town still in existence. That town being Piedmont.

(Slide 2) This slide shows alignment of the Aspen Tunnel construction in 1901 and a newer tunnel, Altamont, constructed in the early 1950's. The Oil Springs Fault runs through the west end of the Aspen Tunnel which gave them trouble in the 1901 construction and we had similar problems with our 1975 construction. The Oil Springs Fault is a secondary fault off of the Absaroka Fault. (Pointing to Aspen Tunnel and Oil Springs Fault)

(Slide 3) This 1975 slide taken from the top of the mountain looking west down to the west portals of Aspen and Altamont Tunnels shows camp site and surrounding terrain for approximately five to ten miles. Slide relates to previous slide.

(Slide 4) This slide shows the timber sets used for cribbing in the 1901 construction. The top arch being constructed first, known as the heading, and the bench was excavated several hundred feet behind to subinvert with an overall height of 23 feet 6 inches.

(Slide 5) Actual picture from 1901 construction showing the heading with the timber sets in place and a group of 13 miners. Not too many hard hats worn in 1901.

(Slide 6) Mark Hurlburt, our U.P. inspector, shown here with the discarded timber set from 1901. We found about 50 of these sets about one-quarter mile from the west portal.

(Slide 7) This slide shows an elevation view of the original boring and the 16 ft. by 16 ft. shaft drilled from overhead approximately at mid-tunnel. The 16 ft. by 16 ft. shaft was sunk to give them an additional two headings. One heading from the east portal; one heading from the west portal; and two directions from the shaft (pointing to the shaft). This shaft did not prove to be that successful because they only made it 600 ft. to the east and approximately 800 ft. to the west—plus, in the process of sinking the shaft, 4 men were killed. Throughout the construction of the tunnel in 1901, as near as I can tell from old records, there were 10 men killed.

(Slide 8) Shows 1901 picture of the Cook Shack and several men

(Slide 9) Shows 1901 picture of not too modern living quarters for the miners (tent).

(Slide 10) This slide shows a steam shovel that was especially built for this construction with a boom height of 16 ft. and a three-quarter yard bucket. The ventilating system shown above the west portal was steam powered and supplied the fresh air necessary for construction.

(Slide 11) 1901 slide shows miners and one small boy. Families lived at camp site.

(Slide 12) This slide shows the 1901 construction through the fault area with the 8 in. by 12 in. I-beams on two-foot centers. Their first concrete pour was poured up the side wall nine feet. The second pour being five feet up the side wall and the third pour was through the overhead arch, which must have been a tough job due to the fact that the concrete must have been literally pushed and shoveled into place.

(Slide 13) This slide shows construction of the batch plant and the drilling of the eight-inch slick line. The batch plant was constructed at the top of the mountain near the mid-point of the tunnel. All of the concrete was batched at this location and was dropped through the eight-inch slick line to the center of the tunnel. From that point, it was pumped by two concrete pumps, or, when pumping was not possible, due to distance, two transit mixers were placed in the tunnel—one heading in each direction so that we could pour at two heading locations at the same time.

(Slide 14) This slide shows the aggregate used for the concrete which was covered to hold out the moisture to keep the stock pile from freezing through the winter months. Through the construction of the tunnel, the aggregate was placed in the batch plant which was 80 ft. by 150 ft, and was allowed to thaw out in the building.

(Slide 15) This slide shows the drilling of the water well just below the batch plant. The well was drilled to a depth of 750 ft. before obtaining a sufficient amount of water. On the left is the Morrison-Knudsen project engineer —Morrison-Knudsen Construction Company being our contractor for the lowering of the tunnel. The man on the right was the driller operator. After the drilling of 750 ft., we attempted to lower an eight-inch casing for the well. After lowering 200 ft. of the casing, it became lodged. Here we are attempting to jack out the casing with two 100-ton jacks which was unsuccessful. Then we went to a six-inch casing lowering it through the eight-inch casing to a depth of 720 ft.

(Slide 16) Picture shows horizon looking south.

(Slide 17) This slide shows the 8-yard batcher in the batch plant and the hopper for the eight-inch slick line that went into the center of the tunnel 340 ft. below. All the concrete was heated when required.

(Slide 18) This slide shows one of the concrete pumps directly below our slick line. Directly above was a secondary remix hopper to prevent any segregation of the concrete. Directly below the arch of the tunnel coming from the eight-inch slick line was a two-inch steel 12-in. by 12-in. deflection wear plate. This wear plate was just about completely disintegrated after 200 yards of concrete was dropped through the slick line. At that point the wear plate was changed out. There was approximately 25,000 yards of concrete poured to complete the tunnel project for the side walls and invert.

(Slide 19) This slide shows the reason for lowering the floor of the Aspen Tunnel. (pointing to outline of the old tunnel) This shows the clearance line of the old tunnel before construction, which was not quite adequate as you can see.

(Slide 20) This slide shows the rock-bolt system which we used in an attempt to hold the old liner in place while we dropped out from under the side wall and invert. We used 10-ft. and 20-ft. rock bolts on each side wall on an alternating spacing of five-foot centers. This is an expansion-type rock-bolt that is grouted to obtain additional holding power. We were attempting to obtain a 10-ton holding power which we obtained on very few bolts. Once we started pumping grout into the bolts, the shale was so porous that at times we had grout coming out of the cold joints some 30 ft. away. (point to slide) This is the location where we propped the side wall and invert from under the overhead arch which was left in place. From this point we kept the existing liner intact.

(Slide 21) This is a hydro hammer we used at the beginning of construction in an attempt to knock away the side wall which was unsuccessful. Here is a picture of a typical miner and if the slide was a little better, you could see that his nose had been broken at least 20 times—not from the job however!

(Slide 22) This was one of our first blasts-off of the west portal and notice the outside privy located on the south side. The following picture will show the concussion that was created by the blasting.

(Slide 23) This slide shows 5 to 10 seconds after the initial blast shown on previous slide which just about knocked over the privy from the concussion. By the way, no one was in it! Normally, the concussion was tremendous in the tunnel due, simply, to only two directions for it to go—which our chief engineer, R. M. Brown, and construction engineer, H. B. Durant, can verify by their frequent inspection trips. I am not sure they trusted me.

(Slides 24 & 25) This, and the following slide, show typical aftermath from blasting. In some cases, as high as 10 cases of dynamite—60%, were used to blast a 15 ft. area.

Slide 26) At the start of the job the invert floor was removed and the center was excavated as shown—center slot was possible for some 2000 feet in from the east portal, and then was stopped due to water problems. At this point a bulkhead was put in and we started the concrete pours back to the east—the center slot operation from the west portal was carried some 1000 feet in—at that point we hit the first of the Oil Springs Fault area which I will show on later slides.

(Slide 27) Once the center slot operation had stopped on the east and west headings, side wall excavation was started.

(Slide 28) At this point we were unsure of the pressures that might result when the side walls were excavated, so to protect the portal mouths, 12-in., 53-lb. H-piling was installed as overhead struts and under-pinning. Overhead struts being on 10-foot centers and under-pinning being on 10-foot centers.

(Slide 29) Our first two pours were made with timber walers across the tunnel for support.

(Slide 30) This slide shows the 131-lb. rail we used as reinforcement on 2-foot centers in the invert. This system was used throughout the tunnel except for the 700-foot fault area which I will show on upcoming slides.

(Slide 31) This concrete was brought off the top of the mountain by transit mixers and poured by belt method.

(Slide 32) This was our system used through most of the tunnel to excavate blasted material with an 11-yard tunnel mucker. On the right of the slide one of our weep holes installed on 20-foot centers. As you can see here, weep hole is already in operation.

(Slide 33) This slide shows the typical problem we had with water even after the new floor had been installed. We are looking at the east portal of the Aspen Tunnel and if you look very close, you can see a small light dot which is light from the west portal—5,900 feet away.

(Slide 34) This slide shows the camp site where they were cutting up 131-lb. rail for under-pinning. Also, this rail, after being installed as under-pinning, was used as guide lines for reinforcing steel.

(Slide 35) This is a typical shot of Morrison-Knudsen camp area which unfortunately due to weather was slop most of the time.

(Slide 36) This was the heating system and fresh air system used throughout the duration of the construction. There were three 1-million BTU heaters with a forced-air system that supplied the tunnel with heat and fresh air. When temperatures dropped to 20 below, a curtain was dropped over the west portal. This system worked very well even when temperatures dropped to 20 below. Temperature inside the tunnel never got below 55°.

(Slide 37) This slide shows the 1901 heating and fresh air system in contrast to the previous slide of our 1975 system. I wonder if temperatures dropped below 55° in the tunnel—which I am sure they did.

(Slide 38) When we dropped the grade outside the tunnel 5½ feet, we had to lay back the existing slopes. In doing so, we excavated a type of French drain system which was installed in 1901. What they did was excavate in ten or twelve places down the slope with a 4-ft. by 6-ft. trench—then they piled timber in these trenches, covered them over, then drenched the lumber with fuel oil and set fire to it in an attempt to create a French drain system.

(Slide 39) This slide shows an identical picture of the area as my previous slide taken from the same location. After they had this problem, is when, I assume, they put in and burned out French-type drains (Referring back to previous slide 38). We solved our 1975 problem by a similar method. We first laid this slide area back on 3:1 slope. Then digging 4-ft. by 8-ft. trenches on 20-ft. centers down the slope and filling them with washed sand gravel to create a French-drain system. This was then tied into a culvert system that we ran out to the daylight.

(Slide 40) We have had a similar problem off the west portal for the past 75 years. When the slopes were laid back off the east portal, we installed a rock buttress 6-feet below the slip line. In construction of the buttress, we made a vertical cut 6 feet below the slip line. As soon as we excavated below the slip line, I thought the entire mountain started coming in on us as I will show in the next two slides. We were prepared for this and literally bombed this rock buttress to prevent any further movement from above.

(Slide 41) This slide typifies the movement that was created after we made our vertical cut below the slip line just below this area.

(Slide 42) In the end result we wrapped this rock buttress completely around the west portal. Buttress design came from Shannon Wilson Consulting Firm out of Seattle, Washington.

(Slide 43) Picture shows air track drilling extensometer hole.

(Slide 44) This slide shows our instrumentation that was used throughout the tunnel project. Below this area original invert from side walls was excavated. Above this line then, the existing concrete arch was left intact as I have explained before. To monitor any sidewall movement, we used two methods: one being the mechanical extensometer placed in strategic locations through the tunnel as shown on this drawing. In the immediate construction area we would monitor these extensometers daily or every shift as the tunnel operation went on 24 hours a day, six days a week. There was a 10-foot anchor and a 25-foot anchor behind the face of the liner, which in turn was anchored to the face of the liner. After every blast we could monitor the side wall movement to the thousandth of an inch.

The second method was a tape extensometer used as such with an anchor attached to each side wall and then simply monitoring total closure. The tape extensometer worked very well due to in the critical areas we could install these on 10-foot centers and read them hourly if needed, which we did through the fault area where we had considerable trouble with side-wall movement.

(Slide 45) Upon center slotting from the west portal to the east, we hit the fault area where we immediately had problems with side-wall movement. At this point we had a closure of 3/8" on each wall and moving. As near as we could tell the liner was moving down and, due to the configuration of the overhead arch, forced the liner in. For corrective measures, we instantly stopped center slot operations and poured a 10-foot section of side wall and invert which stabilized the movement at this point.

(Slide 46) This slide shows our 12-in. by 53-lb. H-piling that we used for overhead struts that are badly deformed from failure.

(Slides 47 & 48) We calculated that

these 12-in. H-piling would stand some 200-tons before failing. When additional overheat struts started to fail, we then placed these struts on 5-foot centers. This worked well until we proceeded another 200 ft. into the fault area. At that time we went to 8-in. channel iron which we welded on the top and bottom down through the center of the overhead struts. This gave us approximately a load capacity of close to 400-tons per strut. This additional strength solved our side wall movement through the duration of the construction in the fault area.

(Slide 49) This slide shows the existing 12-in. I-beam that was placed on 2-ft. centers through the fault area. We calculated the proper elevation for each existing I-beam, then made our cut which is shown on this slide and extended the new 12-in. I-beam vertically down through the wall and across the invert.

(Slide 50) This slide shows they had similar or identical problems with the fault area in 1901 as we did in 1975.

(Slide 51) Here we welded our new 12-in. I-beams and brought them down vertically to the new walls, thus making our 5½ ft. drop in the tunnel floor.

(Slide 52) This slide shows some of the timber bracing that we found from original construction that they used for cribbing to hold back possible sluffing. This was well behind our concrete line; so as not to disturb the shale, we left these in place.

(Slide 53) Typical picture showing (on the right side) where the existing ribs were being cut to grade, and on the left side, extending the I-beams vertically down to the invert.

(Slide 54) This is our typical reinforcing layout through the fault area.

(Slide 55) This was our steel-form system that was hung from the overhead studs on rollers. Once we made our monolithic pour of the side walls and invert, the knee braces and struts were broken down and the forms were rolled ahead for the next pour.

(Slide 56) Looking close at this slide, you can see the small sliver of red light. This was our laser beam we used for line and grade through the tunnel. This worked very well because all the tunnel hands could find this at any time.

(Slides 57 & 58) The next two slides show just in behind the steel form line showing our reinforcing setup and how we used the 153-lb. rail for under-pinning and guide lines for our rebar.

(Slide 59) This is the 11-yd. mucker that was used to remove the excavation material and haul men and equipment to the heading. As you can see there wasn't much room for clearance—or at least he didn't make a U-turn when he felt like it.

(Slide 60) This slide shows some of the concrete that was poured in 1901. Most of their concrete had three-inch aggregate. This concrete does not look like the best quality, but had a tremendous strength.

(Slide 61) Through most of the tunnel, for a drainage system we installed a 24-in. concrete pipe down the center of the invert. This was cut down through the shale and installed just below our concrete sub-invert or just below the floor. The remaining one-third, we installed twin 8-in. plastic pipe on either side of the floor with area inlets placed throughout the tunnel.

(Slide 62) Once the side walls and invert were poured, we shot-creted the cold joint.

(Slide 63) This slide shows the final blast of the tunnel construction through the fault area. We had one of our inspections just by chance on this day so we got everyone in the picture. On the right is V. N. Smedley, senior resident engineer, R. H. Uhrich, district engineer, R. M. Brown, our chief engineer, Bill Beebe, Morrison-Knudsen project engineer, Bill Sablowsky, Morrison-Knudsen superintendent and myself—a shell-shocked Dave Monson. This is how a railroad man looks after 15 tons of dynamite and 18 months later. Our construction engineer, H. B. Durant, who headed up this project, was not present on this date.

(Slide 64) This picture shows our completed side wall and invert through the west portal. I am pointing to the old floor line before construction.

(Slide 65) Here is finished product looking through the west portal after the track was laid. We laid the track through the tunnel by first laying panels. We had an 80-ton hydro-crane with an 80-ft. reach set just ahead of our paneling operation. We then fed the panels to the multi-crane from flat cars. The multi-crane would reach over the end of the flat car and re-track the boom until the panel was in place. Then the flat car was shoved ahead so the multi-crane could pick and lay another panel. This method worked very well through the mile-long tunnel. We then dumped our ballast and raised to within a half-inch of grade. At this point we laid down and installed our CWR before making our final surface. We then utilized the panel rail for double guard rail as shown.

(Slide 66) Picture of finished product through west portal.

(Slides 67 & 68) This is the day I was waiting for—opening day—December 8, 1975—first train through the completed tunnel. (Flipping to next slide) My last slide shows the first train coming out of the east portal with our general manager, . A. Durant at the throttle. We did place a new date plate on the portal face as you can see—our 1901 and 1975 construction—by the way, as directed by our chief engineer, R. M. Brown.

President Williams: Thank you, Mr. Monson, for sharing this most interesting engineering and construction undertaking with us.

Mr. Rankin, will you please introduce the next speaker?

Introduction of A. R. Dahlberg

Mr. Rankin: Our next special feature is about one of the happenings we do not look forward to with anticipation—it is one of the *hazards* to be endured and has occurred to most of us here. To bring us an illustrated discussion of how they coped with the problem of restoring a major bridge burnout, we have a gentleman who needs no introduction to this group. He is one of our esteemed Past Presidents. It is an honor and pleasure to present to you—Mr. A. R. Dahlberg—who will address us at this time. Mr. Dahlberg, assistant engineer, ATSF Railway, Amarillo, Texas.

Bridge Burnout on the Santa Fe

By A. R. DAHLBERG

Assistant Engineer, Santa Fe, Amarillo, Tex.

[This feature was comprised of the presentation of many slides beginning with the structure after the fire and ending with a view of the bridge back in service. Mr. Dahlberg narrated the presentation. *Editor*]

President Williams: Thank you very much, Mr. Dahlberg.

On behalf of the Association, I want to thank our outgoing directors, O. C. Denz and W. E. Brakensiek for their work over the past three years. (Presented certificates)

Our Nominating Committee has determined its recommendations with regard to Officers and Directors of the Association for the coming year. The Nominating Committee is composed of the five most recent Past Presidents, and has been chaired by Mr. John Ridgeway.

Will Mr. Ridgeway please come to the platform and conduct the election and installation of those selected.

At this time, as my last official act as President, I would like to again express my thanks for the hearty support I have received from the Membership, Directors, Officers and, of course, our Secretary. I step down assured that my successor, Warren Rankin, will receive the same support.

Mr. Ridgeway will you please begin the election.

Installation of Officers

Mr. Ridgway: Thank you, President Williams. The Nominating Committee, which is composed of the five Past Presidents, has the following slate of candidates to offer to the membership.

We have one Director to elect for a one-year term. This candidate is J. W. Chambers, bridge construction engineer, Missouri Pacific. For the three Directors for a three-year term are J. Budzileni, assistant to bridge engineer, Rock Island; B. J. King, bridge engineer, Coast Lines, Santa Fe; and J. G. Robertson, manager engineering design, B.&L.E.

For Secretary: Ann Wilson; for Treasurer, W. H. Huffman, assistant vice president and chief engineer (retired), North Western.

For Third Vice President, D. C. Gould, assistant structural engineer, U.P.; Second Vice President, W. C. Sturm, senior project engineer, E. J. & E.; First Vice President, J. B. Iwinski, assistant chief engineer-maintenance, North Western; and for President, W. H. Rankin, senior structural engineer, Frisco.

Are there any nominations from the floor? (pause) Since there seems to be no further nominees, I shall entertain a motion to elect the slate as presented unanimously. (Motion is made and carried) Will the new officers please come to the rostrum? You are now duly installed.

Gentlemen, these will be the officers of your organization for the coming year 1976-1977. (Applause).

President-Elect Rankin: My name is Warren Rankin and I accept with humility the honor and trust you have bestowed upon me by naming me as your President. I pledge to you my best effort to continue the fine program developed by a long line of past leaders. I ask the continued support of our staff and members, as we attempt to face the tasks before us. I will call upon the wisdom and experience of our able group of Past Presidents for guidance. Our industry and Organization are beset by many problems which require adjusting to.

As with any endeavor, a most important ingredient is PARTICIPATION. I therefore am calling a meeting of the Executive Committee immediately after the close of this Convention, to launch out on our next year's work.

Past President Williams, my first official act and most satisfying is one to recognize the hard work and long service of our Immediate Past President, Mr. Jack Williams. Through his efforts, we have enjoyed this fine convention.

As a memento of his tenure with us and an expression of our appreciation for his service, it gives me great pleasure to present him this plaque. We will continue with the benefit of his counsel as the Past President and member of the Executive Committee.

Are there any other matters which should be brought before this Convention? (A representative of REMSA presented a gavel to the President-Elect)

I now declare the 81st Annual Convention of the American Railway Bridge & Building Association to be adjourned.

Will the members of the Executive Committee please assemble in the front? (Strikes gavel)

Past Officers

	1891-1892	1892-1893	1893-1894	1894-1895
President	O. J. Travis	H. M. Hall	J. E. Wallace	Geo. W. Andrews
1st V.-Pres.	H. M. Hall	J. E. Wallace	Geo. W. Andrews	W. A. McGonagle
2nd V.-Pres.	J. B. Mitchell	G. W. Hinman	W. A. McGonagle	L. K. Spafford
3rd V.-Pres.	James Stannard	N. W. Thompson	L. K. Spafford	James Stannard
4th V.-Pres.	G. W. Hinman	C. T. Fuller	E. D. Hines	Walter G. Berg
Secretary	C. W. Gooch	S. F. Patterson	S. F Patterson	S. F. Patterson
Treasurer	George M. Reid	George M. Reid	George M. Reid	George M. Reid
Executive Members	W. R. Damon	G. W. Andrews	Q. McNab	James Stannard
	G. W. Markley	J. M. Staten	A. S. Markley	James H. Travis
	W. A. McGonagle	J. M. Caldwell	Floyd Ingram	J. H. Cummin
	C. W. McGehee	Q. McNab	James Stannard	R. M. Peck
	G. W. Turner	Floyd Ingram	James H. Travis	J. L. White
	J. E. Wallace	A. S. Markley	J. H. Cummin	A. Shane

	1895-1896	1896-1897	1897-1898	1898-1899
President	W. A. McGonagle	James Stannard	Walter G. Berg	J. M. Cummin
1st V.-Pres.	L. K. Spafford	Walter G. Berg	J. H. Cummin	A. S. Markley
2nd V.-Pres.	James Stannard	J. H. Cummin	A. S. Markley	C. C. Mallard
3rd V.-Pres.	Walter G. Berg	A. S. Markley	G. W. Hinman	W. A. Rogers
4th V.-Pres.	J. H. Cummin	R. M. Peck	C. C. Mallard	J. M. Staten
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	George M. Reid	N. W. Thompson	N. W. Thompson	N. W. Thompson
Executive Members	R. M. Peck	W. O. Eggleston	G. J. Bishop	Wm. S. Danes
	L. J. White	W. M. Noon	C. P. Austin	J. H. Markley
	A. Shane	J. M. Staten	M. Riney	W. O. Eggleston
	A. S. Markley	G. J. Bishop	Wm. S. Danes	R. L. Heflin
	W. M. Noon	C. P. Austin	J. H. Markley	F. W. Tanner
	J. M. Staten	M. Riney	W. O. Eggleston	A. Zimmerman

	1899-1900	1900-1901	1901-1902	1902-1903
President	Aaron S. Markley	W. A. Rogers	W. S. Danes	B. F. Pickering
1st V.-Pres.	W. A. Rogers	W. S. Danes	B. F. Pickering	C. C. Mallard
2nd V.-Pres.	J. M. Staten	B. G. Pickering	A. Shane	A. Shane
3rd V.-Pres.	Wm. S. Danes	A. Shane	A. Zimmerman	A. Zimmerman
4th V.-Pres.	B. F. Pickering	A. Zimmerman	C. C. Mallard	A. Montzheimer
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	N. W. Thompson	N. W. Thompson	N. W. Thompson	N. W. Thompson
Executive Members	T. M. Strain	T. M. Strain	A. Montzheimer	W. E. Smith
	R. L. Heflin	H. D. Cleaveland	W. E. Smith	A. W. Merrick
	F. W. Tanner	F. W. Turner	A. W. Merrick	C. P. Austin
	A. Zimmerman	A. Montzheimer	C. P. Austin	C. A. Lichty
	H. D. Cleaveland	W. E. Smith	C. A. Lichty	W. O. Eggleston
	A. Montzheimer	A. W. Merrick	W O. Eggleston	J. H. Markley

	1903-1904	1904-1905	1905-1906	1906-1907
President	A. Montzheimer	C. A. Lichty	J. B. Sheldon	J. H. Markley
1st V.-Pres.	A. Shane	J. B. Sheldon	J. H. Markley	R. H. Reid
2nd V.-Pres.	C. A. Lichty	J. H. Markley	R. H. Reid	J. P. Canty
3rd V.-Pres.	J. B. Sheldon	R. H. Reid	R. C. Sattley	H. Rettinghouse
4th V.-Pres.	J. H. Markley	R. C. Sattley	J. P. Canty	F. E. Schall
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	C. P. Austin	C. P. Austin	C. P. Austin	C. P. Austin
Executive Members	R. H. Reid	W. O. Eggleston	H. Rettinghouse	W. O. Eggleston
	W. O. Eggleston	A. E. Killam	A. E. Killam	A. E. Killam
	A. E. Killam	H. Rettinghouse	J. S. Lemond	J. S. Lemond
	R. C. Sattley	J. S. Lemond	C. W. Richey	C. W. Richey
	H. Rettinghouse	W. H. Finley	W. O. Eggleston	H. H. Eggleston
	J. S. Lemond	C. W. Richey	F. E. Schall	B. J. Sweatt

	1907-1908	1908-1909	1909-1910	1910-1911
President	R. H. Reid	J. P. Canty	H. Rettinghouse	H. Rettinghouse
1st V.-Pres.	J. P. Canty	H. Rettinghouse	J. S. Lemond	F. E. Schall
2nd V.-Pres.	H. Rettinghouse	F. E. Schall	F. E. Schall	A. E. Killam
3rd V.-Pres.	F. E. Schall	J. S. Lemond	A. E. Killam	J. N. Penwell
4th V.-Pres.	W. O. Eggleston	A. E. Killam	J. N. Penwell	L. D. Hadwen
Secretary	S. F. Patterson	S. F. Patterson	C. A. Lichty	C. A. Lichty
Treasurer	C. P. Austin	C. P. Austin	J. P. Canty	J. P. Canty
Executive Members	A. E. Killam	J. N. Penwell	W. Beahan	T. J. Fullem
	J. S. Lemond	Willard Beahan	F. B. Scheetz	G. Aldrich
	C. W. Richey	F. B. Scheetz	L. D. Hadwen	P. Swenson
	T. S. Leake	W. H. Finley	T. J. Fullem	G. W. Rear
	W. H. Finley	L. D. Hadwen	G. Aldrich	W. O. Eggleston
	J. N. Penwell	T. J. Fullem	P. Swenson	W. F. Steffens

	1911-1912	1912-1913	1913-1914	1914-1915
President	F. E. Schall	A. E. Killam	J. N. Penwell	L. D. Hadwen
1st V.-Pres	A. E. Killam	J. N. Penwell	L. D. Hadwen	G. Aldrich
2nd V.-Pres	J. N. Penwell	L. D. Hadwen	G. Aldrich	G. W. Rear
3rd V.-Pres	L. D. Hadwen	T. J. Fullem	G. W. Rear	C. E. Smith
4th V.-Pres	T. J. Fullen	G. Aldrich	C. E. Smith	E. B. Ashby
Secretary	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Treasurer	J. P. Canty	J. P. Canty	J. P. Canty	F. E. Weise
Executive Members	G. Aldrich	G. W. Rear	W. F. Steffens	W. F. Steffens
	P. Swenson	W. F. Steffens	E. B. Ashby	S. C. Tanner
	G. W. Rear	E. B. Ashby	S. C. Tanner	Lee Jutton
	W. F. Steffens	C. E. Smith	Lee Jutton	F. F. Strouse
	E. B. Ashby	S. C. Tanner	W. F. Strouse	C. R. Knowles
	W. O. Eggleston	Lee Jutton	C. R. Knowles	A. Ridgway

	1915-1916	1916-1917	1917-1918	1918-1919
President	G. W. Rear	C. E. Smith	S. C. Tanner	Lee Jutton
1st V.-Pres	C. E. Smith	E. B. Ashby	Lee Jutton	F. E. Weise
2nd V.-Pres	E. B. Ashby	S. C. Tanner	F. E. Weise	W. F. Strouse
3rd V.-Pres	S. C. Tanner	Lee Jutton	W. F. Strouse	C. R. Knowles
4th V.-Pres	Lee Jutton	F. E. Weise	C. R. Knowles	A. Ridgway
Sec.-Treas	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Executive Members	F. E. Weise	W. F. Strouse	A. Ridgway	J. S. Robinson
	W. F. Strouse	C. R. Knowles	J. S. Robinson	J. P. Wood
	C. R. Knowles	A. Ridgway	J. P. Wood	A. B. McVay
	A. Ridgway	J. S. Robinson	D. C. Zook	J. H. Johnston
	J. S. Robinson	J. P. Wood	A. B. McVay	E. T. Howson
	J. P. Wood	D. C. Zook	J. H. Johnston	C. W. Wright

	1919-1920	1920-1921	1921-1922	1922-1923
President	F. E. Weise	W. F. Strouse	C. R. Knowles	Arthur Ridgway
1st V.-Pres	W. F. Strouse	C. R. Knowles	A. Ridgway	J. P. Wood
2nd V.-Pres	C. R. Knowles	A. Ridgway	J. S. Robinson	J. S. Robinson
3rd V.-Pres	A. Ridgway	J. S. Robinson	J. P. Wood	C. W. Wright
4th V.-Pres	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
Sec.-Treas	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec			F. E. Weise	F. E. Weise
Directors	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
	A. B. McVay	A. B. McVay	J. H. Johnston	Maro Johnson
	J. H. Johnston	G. A. Manthey	E. K. Barrett	O. F. Dalstrom
	E. T. Howson	E. T. Howson	F. C. Baluss	S. D. Corey
	C. W. Wright	J. H. Johnston	Maro Johnson	W. B. Hotson
	G. A. Manthey	E. K. Barrett	O. F. Dalstrom	P. N. Nelson

	1923-1924	1924-1925	1925-1926	1926-1927
President	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
1st V.-Pres	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
2nd V.-Pres	C. W. Wright	E. T. Howson	F. C. Baluss	Maro Johnson
3rd V.-Pres	E. T. Howson	F. C. Baluss	Maro Johnson	J. S. Huntoon
4th V.-Pres	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
Sec.-Treas	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec	F. E. Weise	F. E. Weise	F. E. Weise	F. E. Weise
Directors	S. T. Corey	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
	W. B. Hotson	A. I. Gauthier	W. B. Hotson	E. L. Sinclair
	P. N. Nelson	E. L. Sinclair	P. N. Nelson	P. F. Dalstrom
	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	W. T. Krausch
	A. I. Gauthier	W. B. Hotson	E. L. Sinclair	R. C. Bardwell
	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom	H. I. Benjamin

	1927-1928	1928-1929	1929-1930	1930-1934
President	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
1st V.-Pres	Maro Johnson	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
2nd V.-Pres	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	H. I. Benjamin
3rd V.-Pres	C. S. Heritage	A. I. Gauthier	H. I. Benjamin	W. T. Krausch
4th V.-Pres	A. I. Gauthier	H. I. Benjamin	W. T. Krausch	T. H. Strate
Sec.-Treas	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec	F. E. Weise	F. E. Weise		
Directors	W. T. Krausch	R. C. Henderson	G. A. Rodman	E. C. Neville
	R. C. Bardwell	J. S. Ekey	W. A. Batey	H. H. Best
	H. I. Benjamin	T. H. Strate	F. W. Hillman	J. E. King
	R. C. Henderson	G. A. Rodman	E. C. Neville	A. B. Scowden
	T. H. Strate	W. A. Batey	H. H. Best	W. A. Batey
	J. S. Ekey	F. W. Hillman	J. E. King	L. C. Smith

	1934-1935	1935-1936	1936-1937	1937-1938
President	H. I. Benjamin	T. H. Strate	E. C. Neville	C. M. Burpee
1st V.-Pres.	T. H. Strate	E. C. Neville	C. M. Burpee	F. H. Masters
2nd V.-Pres.	E. C. Neville	C. M. Burpee	F. H. Masters	W. S. Lacher
3rd V.-Pres.	A. B. Scowden	F. H. Masters	C. A. J. Richards	C. A. J. Richards
4th V.-Pres.	W. R. Roof	C. A. J. Richards	W. S. Lacher	F. H. Cramer
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Directors	C. M. Burpee W. A. Batey L. C. Smith C. A. J. Richards A. L. McCoy R. P. Luck	A. L. McCloy R. P. Luck H. H. Best W. R. Roof T. P. Soule F. H. Cramer	W. R. Roof T. P. Soule F. H. Cramer B. R. Meyers G. S. Crites R. E. Dove	B. R. Meyers G. S. Crites R. E. Dove T. P. Soule A. Chinn L. G. Byrd

	1938-1939	1939-1940	1940-1941	1941-1942
President	Armstrong Chinn	A. E. Bechtelheimer	H. M. Church	R. E. Dove
1st V.-Pres.	F. H. Cramer	F. H. Cramer	R. E. Dove	F. H. Soothill
2nd V.-Pres.	A. E. Bechtelheimer	H. M. Church	F. A. Soothill	G. S. Crites
3rd V.-Pres.	H. M. Church	R. E. Dove	G. S. Crites	A. M. Knowles
4th V.-Pres.	R. E. Dove	F. H. Soothill	A. M. Knowles	N. D. Howard
Sec.-Treas.	C. A. Lichty	C. A. Lichty		
Secretary	....	....	F. O. Whiteman	A. G. Shaver
Treasurer	....	....	F. E. Weise	F. E. Weise
Directors	L. G. Byrd W. R. Ganser F. H. Soothill B. R. Meyers W. Walkden A. S. Krefting	B. R. Meyers W. Walkden A. S. Krefting A. M. Knowles L. G. Byrd K. L. Miner	N. D. Howard L. G. Byrd K. L. Miner R. E. Candle I. A. Moore W. A. Sweet	R. E. Caudle I. A. Moore W. A. Sweet J. L. Varker L. E. Peyser Martin Meyer

	1942-1943	1943-1944	1944-1945	1945-1946
President	G. S. Crites	J. L. Varker	J. L. Varker	N. D. Howard
1st V.-Pres.	R. E. Candle	R. E. Caudle	R. E. Caudle	F. G. Campbell
2nd V.-Pres.	A. M. Knowles	N. D. Howard	N. D. Howard	J. S. Hancock
3rd V.-Pres.	N. D. Howard	F. G. Campbell	F. G. Campbell	E. H. Barnhart
4th V.-Pres.	J. L. Varker	J. S. Hancock	J. S. Hancock	W. F. Martens
Secretary	A. G. Shaver† Lorene Kindred‡ Elinor V. Heffern	Elinor V. Heffern	Elise LaChance	Elise LaChance
Treasurer	F. E. Weise	C. R. Knowles	C. R. Knowles	C. R. Knowles
Treasurer Emeritus		F. E. Weise	F. E. Weise	
Directors	M. Meyer L. E. Peyser K. L. Miner F. G. Campbell J. S. Hancock L. C. Winkelhaus	W. F. Martens A. L. McCloy L. C. Winkelhaus E. H. Barnhart A. B. Chapman L. E. Peyser	W. F. Martens A. L. McCloy L. C. Winkelhaus E. H. Barnhart A. B. Chapman L. E. Peyser	A. B. Chapman W. A. Huckstep F. R. Spofford Guy E. Martin B. R. Meyers L. E. Peyser

† To November 1, 1962 ‡ To February 1, 1943

	1946-1947	1947-1948	1948-1949	1949-1950
President	F. G. Campbell	J. S. Hancock	E. H. Barnhart	W. F. Martens
1st V.-Pres.	J. S. Hancock	F. H. Barnhart	W. F. Martens	W. A. Huckstep
2nd V.-Pres.	E. H. Barnhart	W. F. Martens	W. A. Huckstep	Guy E. Martin
3rd V.-Pres.	W. F. Martens	W. A. Huckstep	Guy E. Martin	F. R. Spofford
4th V.-Pres.	W. A. Huckstep	G. E. Martin	F. R. Spofford	Lee Mayfield
Treasurer	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	C. R. Knowles	C. R. Knowles	L. C. Winkelhaus	L. C. Winkelhaus
Directors	Guy E. Martin B. R. Meyers L. E. Peyser H. M. Harlow H. B. Christianson F. R. Spofford	H. M. Harlow H. B. Christianson F. R. Spofford Lee Mayfield Franz M. Misch W. D. Gibson	Lee Mayfield F. M. Misch W. D. Gibson H. M. Harlow V. E. Engman G. W. Benson	H. M. Harlow V. E. Engman G. W. Benson F. M. Misch L. R. Morgan J. A. Jorlett

	1950-1951	1951-1952	1952-1953	1953-1954
President	W. A. Huckstep	Guy E. Martin	F. R. Spofford	Lee Mayfield
1st V.-Pres.	Guy E. Martin	F. R. Spofford	Lee Mayfield	H. M. Harlow
2nd V.-Pres.	F. R. Spofford	Lee Mayfield	H. M. Harlow	J. A. Jorlett
3rd V.-Pres.	Lee Mayfield	H. M. Harlow	J. A. Jorlett	R. R. Gunderson
4th V.-Pres.	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	F. M. Misch L. R. Morgan J. A. Jorlett M. H. Dick R. R. Gunderson J. F. Warrenfells	M. H. Dick R. R. Gunderson J. F. Warrenfells W. H. Huffman L. R. Morgan B. M. Stephens	W. H. Huffman L. R. Morgan B. M. Stephens M. H. Dick J. F. Warrenfells G. Switzer	M. H. Dick J. F. Warrenfells G. Switzer B. M. Stephens W. H. Bunge F. R. Schlaf

	1954-1955	1955-1956	1956-1957	1957-1958
President	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
1st V.-Pres.	J. A. Jorlett	R. R. Gunderson	W. H. Huffman	M. H. Dick
2nd V.-Pres.	R. R. Gunderson	W. H. Huffman	M. H. Dick	B. M. Stephens
3rd V.-Pres.	W. H. Huffman	M. H. Dick	B. M. Stephens	H. D. Curie
4th V.-Pres.	M. H. Dick	B. M. Stephens	H. D. Curie	
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhause	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	B. M. Stephens	J. F. Warrenfells	W. H. Bunge	G. W. Benson
	W. H. Bunge	H. D. Curie	E. R. Schlaf	J. M. Lowry
	E. R. Schlaf	J. M. Lowry	G. W. Benson	H. H. Matthews
	J. F. Warrenfells	W. H. Bunge	J. M. Lowry	T. M. von Sprecken
	H. D. Curie	E. R. Schlaf	T. M. von Sprecken	W. H. Bunge
	J. M Lowry	G. W. Benson	H. A. Matthews	E. R. Schlaf

	1958-1959	1959-1960	1960-1961	1961-1962
President	M. H. Dick	B. M. Stephens	H. D. Curie	G. W. Benson
1st V.-Pres.	B. M. Stephens	H. D. Curie	G. W. Benson	J. M. Lowry
2nd V.-Pres.	H. D. Curie	G. W. Benson	J. M. Lowry	E. R. Schlaf
3rd V.-Pres.	G. W. Benson	J. M. Lowry	E. R. Schlaf	H. A. Matthews
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	L. C. Winkelhause	L. C. Winkelhaus	L. C. Winkelhause
Directors	J. M. Lowry	W. H. Bunge	H. A. Matthews	R. C. Baker
	R. C. Baker	E. R. Schlaf	M. J. Hubbard	R. H. Miller
	W. H. Bunge	H. A. Matthews	R. C. Baker	Shirley White
	E. R. Schlaf	M. J. Hubbard	R. H. Miller	H. M. Wilson
	H. A. Matthews	R. C. Baker	Shirley White	R. D. Hellweg
	M. J. Hubbard	R. H. Miller	H. M. Wilson	F. W. Hutcheson

	1962-1963	1963-1964	1964-1965	1965-1966
President	J. M. Lowry	E. R. Schlaf	R. C. Baker	H. M. Wilson
1st V.-Pres.	E. R. Schlaf	R. C. Baker	H. M. Wilson	R. D. Hellweg
2nd V.-Pres.	H. A. Matthews	Shirley White	R. D. Hellweg	J. W. DeValle
3rd V.-Pres.	R. C. Baker	H. M. Wilson	J. W. DeValle	W. F. Armstrong
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	E. F. Snyder	E. F. Snyder	E. F. Snyder
Directors	Shirley White	R. D. Hellweg	W. F. Armstrong	J. A. Goforth
	H. M. Wilson	F. W. Hutcheson	J. S. Ellis	E. R. Simmons
	R. D. Hellweg	W. F. Armstrong	J. A. Goforth	N. D. Bryant
	F. W. Hutcheson	J. W. DeValle	E. R. Simmons	A. R. Dahlberg
	W. F. Armstrong	J. A. Goforth	N. D. Bryant	J. S. Ellis
	J. W. DeValle	E. R. Simmons	A. R. Dahlberg	T. L. Fuller

	1966-1967	1967-1968	1968-1969	1969-1970
President	R. D. Hellweg	J. W. DeValle	W. F. Armstrong	J. A. Goforth
1st V.-Pres.	J. W. DeValle	W. F. Armstrong	J. A. Goforth	A. R. Dahlberg
2nd V.-Pres.	W. F. Armstrong	J. A. Goforth	A. R. Dahlberg	T. L. Fuller
3rd V.-Pres.	J. A. Goforth	A. R. Dahlberg	T. L. Fulle	N. D. Bryant
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	W. H. Huffman	W. H. Huffman	W. H. Huffman	W. H. Huffman
Directors	N. D. Bryant	J. S. Ellis	N. F. Lucas	W. H. Rankin
	A. R. Dahlberg	T. L. Fuller	W. L. Short	E. E. Runde
	H. F. Lucas	R. A. Youngblood	C. E. Wachter	T. A. Reynolds
	J. S. Ellis	H. F. Lucas	A. C. Jones	J. J. Ridgeway
	T. L. Fuller	W. L. Short	W. H. Rankin	J. R. Williams
	R. A. Youngblood	C. E. Wachter	E. E. Runde	J. W. Chambers
	V. D. Raessler	A. C. Jones	T. A. Reynolds	R. E. Frame
	W. L. Short	W. H. Rankin	J. J. Ridgeway	J. C. Hobbs
	C. E. Wachter	E. E. Runde	J. R. Williams	

	1970-1971	1971-1972	1972-1973	1973-1974
President	A. R. Dahlberg	T. L. Fuller	N. D. Bryant	E. E. Runde
1st V.-Pres.	T. L. Fuller	N. D. Bryant	E. E. Runde	J. J. Ridgeway
2nd V.-Pres.	N. D. Bryant	E. E. Runde	J. J. Ridgeway	J. R. Williams
3rd V.-Pres.	E. E. Runde	J. J. Ridgeway	J. R. Williams	W. R. Rankin
Secretary	Ann Wilson	Ann Wilson	Ann Wilson	Ann Wilson
Treasurer	W. H. Huffman	W. H. Huffman	W. H. Huffman	W. H. Huffman
Directors	T. A. Reynolds	J. W. Chambers	R. K. Corbett	D. C. Gould
	J. J. Ridgeway	R. E. Frame	J. R. Iwinski	W. S. Stokely
	J. R. Williams	J. C. Hobbs	J. S. Pritchett	W. C. Sturm
	J. W. Chambers	R. K. Corbett	D. C. Gould	J. W. Davidson
	R. E. Frame	J. R. Iwinsky	W. S. Stokeley	C. A. Hughes
	J. C. Hobbs	J. S. Pritchett	W. C. Sturm	W. R. Hyma
	R. K. Corbett	D. C. Gould	J. W. Davidson	O. C. Denz
	J. R. Iwinsky	W. S. Stokeley	C. A. Hughes	R. C. McMaster
	J. S. Pritchett	W. C. Sturm	W. R. Hyma	W. E. Brakensiek

	1974-1975	1975-1976
President	J. J. Ridgeway	J. R. Williams
1st V.-Pres.	J. R. Williams	W. H. Rankin
2nd V.-Pres.	W. H. Rankin	J. C. Hobbs
3rd V.-Pres.	J. C. Hobbs	J. R. Iwinski
Secretary	Ann Wilson	Ann Wilson
Treasurer	W. H. Huffman	W. H. Huffman
Directors	J. W. Davidson	W. E. Brakensiek
	C. A. Hughes	O. C. Denz
	W. R. Hyma	R. C. McMasters
	W. E. Brakensiek	F. R. Lindsay
	O. C. Denz	M. Noyszewski
	R. C. McMasters	W C. Sturm
	F. B. Lindsay, Jr.	W. J. Gunkle
	M. Noyszewski	W. E. Halley
	Jim Payne	K. L. Wammel

HISTORICAL INFORMATION

List of Annual Conventions

No.	Place of Meeting	Date	Membership
1	St. Louis, Mo.	Sept. 25, 1891	60
2	Cincinnati, Ohio	Oct. 18-19, 1892	112
3	Philadelphia, Pa.	Oct. 17-19, 1893	128
4	Kansas City, Mo.	Oct. 16-18, 1894	115
5	New Orleans, La.	Oct. 15-16, 1895	122
6	Chicago, Ill.	Oct. 20-22, 1896	140
7	Denver, Colo.	Oct. 19-21, 1897	127
8	Richmond, Va.	Oct. 18-19, 1898	148
9	Detroit, Mich.	Oct. 17-19, 1899	148
10	St. Louis, Mo.	Oct. 16-18, 1900	143
11	Atlanta, Ga.	Oct. 15-17, 1901	171
12	Minneapolis, Minn.	Oct. 21-23, 1902	195
13	Quebec, Canada	Oct. 20-22, 1903	223
14	Chicago, Ill.	Oct. 18-20, 1904	293
15	Pittsburgh, Pa.	Oct. 17-19, 1905	313
16	Boston, Mass	Oct. 16-18, 1906	340
17	Milwaukee, Wis.	Oct. 15-17, 1907	341
18	Washington, D. C.	Oct. 20-22, 1908	368
19	Jacksonville, Fla.	Oct. 19-21, 1909	393
20	Denver, Colo.	Oct. 18-20, 1910	428
21	St. Louis, Mo.	Oct. 17-19, 1911	499
22	Baltimore, Md.	Oct. 15-17, 1912	524
23	Montreal, Quebec	Oct. 21-23, 1913	570
24	Los Angeles, Cal.	Oct. 20-22, 1914	586
25	Detroit, Mich.	Oct. 19-21, 1915	665
26	New Orleans. La.	Oct. 17-19, 1916	710
27	Chicago, Ill.	Oct. 16-18, 1917	704
28	Chicago, Ill.	Oct. 15-17, 1918	716
29	Cleveland, Ohio	Oct. 21-23, 1919	776
30	Atlanta, Ga.	Oct. 26-28, 1920	840
31	New York, N. Y.	Oct. 18-20, 1921	850
32	Cincinnati, Ohio	Oct. 17-19, 1922	865

No.	Place of Meeting	Date	Membership
33	Seattle, Wash.	Oct. 16-18, 1923	846
34	Kansas City, Mo.	Oct. 21-23, 1924	837
35	Buffalo, N. Y.	Oct. 20-22, 1925	759
36	Richmond, Va.	Oct. 12-14, 1926	750
37	Minneapolis, Minn.	Oct. 18-20, 1927	754
38	Boston, Mass.	Oct. 23-25, 1928	755
39	New Orleans, La.	Oct. 15-17, 1929	755
40	Louisville, Ky.	Oct. 21-23, 1930	713
41	Chicago, Ill.	Oct. 16-18, 1934	592
42	Chicago, Ill.	Oct. 15-17, 1935	547
43	Chicago, Ill.	Oct. 20-22, 1936	588
44	Chicago, Ill.	Oct. 19-21, 1937	566
45	Chicago, Ill.	Oct. 18-20, 1938	589
46	Chicago, Ill.	Oct. 17-19, 1939	546
47	Chicago, Ill.	Oct. 15-17, 1940	610
48	Chicago, Ill.	Oct. 14-16, 1941	594
49	Chicago, Ill.	Oct. 20-22, 1942	618
50	Chicago, Ill.	Oct. 20-21, 1943	597
51	Chicago, Ill.	Sept. 17-19, 1946	698
52	Chicago, Ill.	Sept. 16-18, 1947	651
53	Chicago, Ill.	Sept. 20-22, 1948	652
54	Chicago, Ill.	Sept. 12-14, 1949	676
55	Chicago, Ill.	Sept. 18-20, 1950	713
56	Chicago, Ill.	Sept. 17-19, 1951	676
57	Chicago, Ill.	Sept. 15-17, 1952	667
58	Chicago, Ill.	Sept. 15-17, 1953	666
59	Chicago, Ill.	Sept. 13-15, 1954	682
60	Chicago, Ill.	Sept. 19-21, 1951	625
61	Chicago, Ill.	Sept. 18-20, 1956	657
62	Chicago, Ill.	Sept. 23-25, 1957	769
63	Chicago, Ill.	Sept. 15-17, 1958	828
64	Chicago, Ill.	Sept. 15-17, 1959	863
65	Chicago, Ill.	Sept. 19-21, 1960	932
66	Chicago, Ill.	Sept. 18-20, 1961	968
67	Chicago, Ill.	Sept. 10-12, 1962	942
68	Chicago, Ill.	Oct. 14-16, 1963	887
69	Chicago, Ill.	Sept. 14-16, 1964	860
70	Chicago, Ill.	Sept. 13-15, 1965	829
71	Chicago, Ill.	Sept. 26-28, 1966	800
72	Chicago, Ill.	Oct. 11-13, 1967	799
73	Chicago, Ill.	Sept. 9-11, 1968	825
74	Chicago, Ill.	Sept. 9-11, 1969	746
75	Chicago. Ill.	Sept. 28-30, 1970	709
76	Chicago, Ill.	Sept. 13-15. 1971	719
77	Chicago, Ill.	Sept. 18-20, 1972	706
78	Chicago, Ill.	Sept. 17-19, 1973	750
79	Chicago, Ill.	Oct. 1- 3, 1974	683
80	Chicago, Ill.	Sept. 15-17, 1975	672
81	Chicago. Ill.	Sept. 13-15, 1976	833

CONSTITUTION

ARTICLE I.

NAME

Section 1. This association shall be known as the American Railway Bridge & Building Association.

ARTICLE II.

OBJECT

Section 1.** The object of this association shall be the advancement of knowledge pertaining to the design, construction and maintenance of railway bridges, buildings, water service facilities, and other structures, by investigation, reports and discussions.

Section 2. The association shall neither indorse nor recommend any particular devices, trade marks or materials, nor will it be responsible for any opinions expressed in papers, reports or discussion unless the same have received the endorsement of the association in regular session.

ARTICLE III.

MEMBERSHIP

Section 1.* The membership of this association shall be divided into four classes, viz: Members, life members, associate members and honorary members.

Section 2.* A member shall be a person in a position above rank of gang foreman in connection with engineering, construction and maintenance for railway bridges, buildings and water service facilities: or in the employ of a public regulatory body, a professor of engineering or architecture, a technical editor, a government or private timber expert, a consulting engineer, or an engineer in his employ, engaged in the engineering, construction and maintenance of railroad-related facilities or an engineer employed by a technical service or research and development organization, an officer or engineer of an engineering or scientific society or association whose aims and objectives are compatible with the aims and objectives of this association. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance.

Section 3.** To be eligible for a life membership a member must have belonged to the association for at least 15†† years and in general must have retired from active railway service due to age or physical disability. He shall have all the privileges of membership, except the holding of office, and shall not be required to pay annual dues. The transfer from membership to life membership shall be made in the same manner as the election of members, as prescribed in Section 2, of this Article.

Section 4. Associates shall be responsible persons who are not eligible as members, whose pursuits or attainments qualify them to co-operate with members in the study and development of improved practices in the construction and maintenance of bridges, buildings and water facilities. They shall have all the rights of members except of voting and holding office. They shall be elected in the manner prescribed for members, in Section 2 of this Article.

Section 5. Honorary members shall be chosen from persons who have attained acknowledged eminence in some branch of engineering or railway service. Their number shall be limited to ten. Honorary members shall be proposed by not less than six active members and shall be elected by the unanimous vote of the members present at a regular meeting. They shall have all the rights of members except that of holding office and shall be exempt from the payment of dues.

Section 6. Any member guilty of conduct unbecoming to a railroad officer and a member of this association, or who shall refuse to comply with the rules of this association, shall forfeit his membership on a two-thirds vote of the executive committee.

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*Amended September, 1976.

** Amended September 20, 1948

†† Amended March 10, 1958.

Section 7. Membership shall continue until written resignation is received by the secretary, unless member has been previously expelled, or dropped for non-payment of dues in accordance with Section 1 of Article VII.

Section 8.** Only members shall hold office in this association, and only members and life members shall be entitled to vote in the election of officers.

ARTICLE IV.

OFFICERS

Section 1§. The officers of the Association shall be a president, three vice-presidents, a secretary, a treasurer and nine directors, who, with the most recent past president, shall constitute the Executive Committee.

Section 2. The past presidents of this association, previous to the most recent past president, who continue to be members shall be privileged to attend all meetings of the executive committee, at which meetings they shall receive due notice, and be permitted to discuss all questions and to aid said committee by their advice and counsel; but said past presidents shall not have a right to vote, unless called upon to fill a quorum.

Section 3. Vacancies in any office shall be filled for the unexpired term by the executive committee without delay.

ARTICLE V.

EXECUTIVE COMMITTEE

Section 1.** The executive committee shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution and by-laws and shall exercise general supervision over the financial interests of the association, and make all necessary purchases and contracts required to conduct the general business of the association, but shall not have the power to render the association liable for any debt beyond the amount then in the treasury plus accounts receivable and not subject to other prior liabilities. All appropriations for special purposes must be acted upon at a regular meeting of the association.

Section 2. Meetings of the executive committee may be called by a majority of the members of the committee, providing 10 days' notice is given members by mail.

Section 3. Five members of the executive committee shall constitute a quorum for the transaction of business.

ARTICLE VI.

ELECTION OF OFFICERS AND TENURE OF OFFICE

Section 1. Except as otherwise provided the officers shall be elected at the regular annual meeting of the association and the election shall not be postponed except by unanimous consent of the members present at said annual meeting. The election shall be by ballot, a majority of the votes cast being required for election. Any member of the association not in arrears for dues shall be eligible for office, but the president shall not be eligible for re-election.

Section 2.§ The president, three vice-presidents, secretary and treasurer shall hold office for one year and the directors for three years, three directors being elected each year. All officers shall retain their office until their successors are elected and installed. A director elected for a three-year term shall not be eligible to serve two consecutive terms.

Section 3.† The term of office of the secretary and the treasurer may be terminated at any time by a two-thirds vote of the executive committee. Their compensation shall be fixed by a majority vote of the executive committee.

The secretary shall also serve as secretary of the executive committee.

Section. 4. The secretary and the treasurer shall be required to give bond in an amount to be fixed by the executive committee.

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[*] Amended October 16, 1941.

[†] Amended September 21, 1957.

[§] Amended September 28, 1966.

ARTICLE VII.

MEMBERSHIP FEE AND DUES

Section 1.† Every member upon joining this association shall pay to the secretary an entrance fee and dues as prescribed by the executive committee. No member in arrears for annual dues shall be entitled to vote at any election and any member more than one year in arrears, may be stricken from the list of members at the discretion of the executive committee.

Section 2.‡ A person stricken from the list of members because of non-payment of dues, upon written application may be reinstated as a member in his former class without loss of privileges, either upon payment of all back dues (which must accompany applicants) or at the discretion of the executive committee voting in the manner prescribed in Section 2, Article III.

ARTICLE VIII.*

LOCAL SECTIONS

Section 1.** Upon the application of ten or more members of the association residing in the same geographical district, or having offices therein, the executive committee shall organize a local section for that district, to which all members in that district shall be eligible. Such local section shall admit to active membership only members in good standing. It shall hold not less than two meetings each year, and shall be governed by such constitution and by-laws not inconsistent with the constitution of this association as the section membership may adopt and the executive committee approve.

Section 2. The parent association shall not be put under any obligation, either financial or in the matter of policy or opinion, by any local section.

ARTICLE IX.

AMENDMENTS

Section 1. This constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that notice of the proposed amendment or amendments has been sent to the members at least 30 days previous to said regular meeting.

By-Laws

TIME OF MEETING

1.** The regular meeting of this association shall convene annually during the month of September, the exact date to be fixed by the executive committee.

PLACE OF MEETING

2.** The place of holding the annual convention shall be Chicago, Ill.

3. It shall be within the power of the executive committee to change the location or time of the meeting if it becomes apparent that it is for the best interests of the association.

QUORUM

4. At the regular meeting of the association, 15 or more members shall constitute a quorum.

***DUES

5. The annual dues for the fiscal year ending August 31, and payable in advance, shall be as follows:*

Members, $7.00; Associate Members, $7.00.

DUTIES OF OFFICERS

6.† The president shall have general supervision over the affairs of the association. He shall preside at all meetings of the association and of the executive committee; shall appoint all committees not otherwise provided for, and shall be ex-officio member of all committees. He shall with the secretary sign all contracts or other written obligations of the association which have been approved by the executive committee. He shall render a detailed report at least three times during the year to the members of the executive committee, showing the financial condition of the association and its activities.

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† Amended October 17, 1940.
* Article adopted 1922.
** Amended September 20, 1948
‡ Amended September 21, 1957.
*** Amended September 15, 1965.

At the annual meeting the president shall present a report containing a statement of the general conditions of the association.

7. The vice-presidents in order of seniority shall preside at meetings in the absence of the president and discharge his duties in case of a vacancy in his office.

8.[†] It shall be the duty of the secretary to keep a correct record of the proceedings of all meetings of this association, and of all accounts, between this association and its members; to collect all moneys due the association, and deposit the same in the name of the association. He shall pay all bills when properly certified and approved by the president and the treasurer, and make such reports as may be called for by the executive committee. He shall also perform such other duties as the association may require.

9.[‡] The treasurer shall have charge of the funds, check all deposits as made by the secretary, sign all checks after they have been approved by the president, and invest all funds not needed for current expenses as directed by the executive committee. He shall report at each annual meeting on the condition of the finances.

NOMINATING COMMITTEE

10.[#] After each annual meeting the president shall appoint a committee consisting of five members. Two Past Presidents shall be members of this committee, one of whom shall act as Chairman. No other officers of the Association shall be appointed to this committee. This committee shall prepare a list of names of nominees for officers to be voted on at the next annual convention in accordance with ARTICLE VI of the Constitution, said list to be read at the business session of said convention. Nothing in this section shall be construed to prevent any member making further nominations.

AUDITING COMMITTEE

11.[‡] Prior to each annual meeting the president shall appoint a committee of three members, not officers of the association, whose duty it shall be to examine the accounts and vouchers of the secretary and the treasurer and certify as to the correctness of their accounts.

COMMITTEE ON SUBJECTS FOR DISCUSSION

12. After each annual meeting the president shall appoint a committee whose duty it shall be to prepare a list of subjects for investigation to be submitted for approval at the next convention.

COMMITTEE ON INVESTIGATION

13. After the association has adopted the list of subjects for investigation the president for the succeeding year shall appoint the committees who shall prepare the subjects for report and discussion. He may also appoint individual members to prepare reports on special subjects, or to report on any special or particular subject.

PUBLICATION COMMITTEE

14. After each annual meeting the executive committee shall appoint a publication committee consisting of three active members whose duty it shall be to cooperate with the secretary in the issuing of the publications of the association. The assignment of this committee shall be such that at least one member shall have served on the committee during the previous year.

[‡] Adopted October 17, 1940.

[#] Amended December 4, 1950.

[†] Amended September 20, 1948.

[‡] Amended September 21, 1957.

ORDER OF BUSINESS

15.† Call to order by president.
Opening prayer or invocation.
President's address.
Report of secretary.
Report of treasurer.
Appointment of special committees.
Reports of standing committees and presentation of papers.
Unfinished business.
New business.
Election of officers.
Installation of officers.
Adjournment.

DECISIONS

16. The votes of a majority of the members present shall decide any questions. motion or resolution which shall be brought before the association, unless otherwise provided. Unless specifically provided herein otherwise, all discussions shall be governed by Robert's rules of order.

AMENDMENTS

17.† The By-Laws can be amended by a two-thirds vote of those present at any regularly called executive committee meeting.

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† Amended September 20, 1948.

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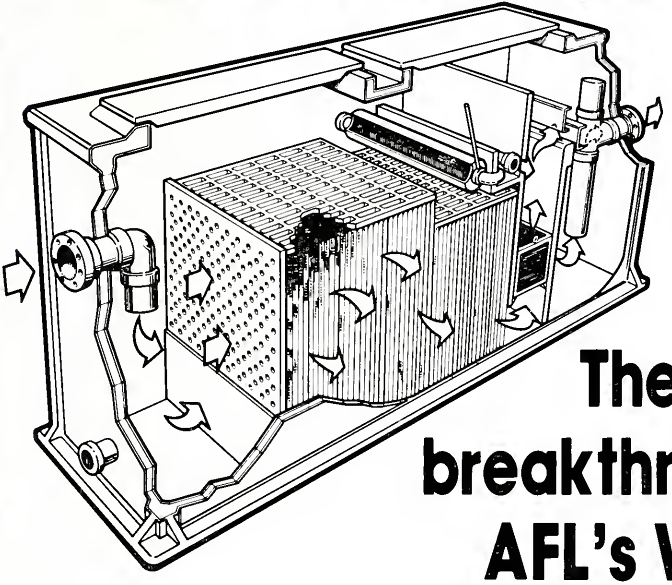

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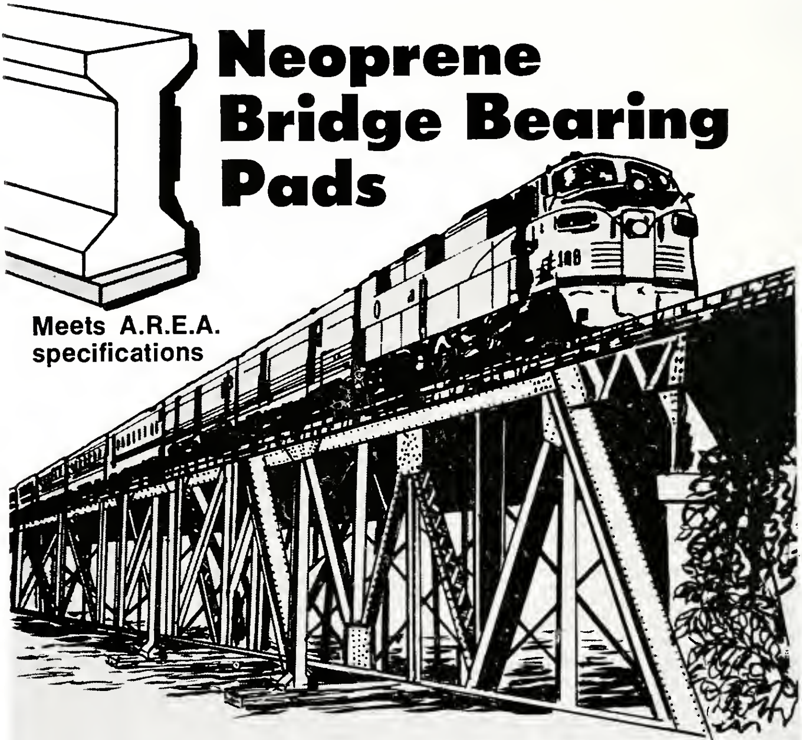

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Benson, G. W.
Curie, H. D.
Dick, M. H.
Dove, R. E.
Gunderson, R. R.
Howard, N. D.
Jorlett, J. A.
Mottier, C. H.
Schlaf, E. R.
Winkelhaus, L. C.

LIFE MEMBERS

Anderson, Arthur
Baker, F. A.
Barsema, M.
Beaver, J. F.
Beeder, R. H.
Bell, D. V.
Beringer, M. A.
Bishop, D. B.
Boehling, H. A., Jr.
Bowman, R. M.
Bradfield, R. G.
Brice, W. T.
Buckmaster, W. A.
Bunge, W. H.
Burch, E. E.
Burpee, C. M.
Carter, J. W.
Celander, H. W.
Christianson, H. B.
Collier, P. B.
Colvin, A. A.
Cooper, S. A.
Cramer, F. H.
Cross, E. T.
Cummins, C. P.
Davis, H. E.
Dixon, C. E.
Duchac, J. V.
Eargle, J. M.
Eichenlaub, C. M.
Elliott, C. E.
Enger, E. M.
Forseth, C. E.
Fort, O. E.
Fox, R. L.
Geyer, C. J.
Giles, J. M.
Harlow, H. M.
Harman, W. C.
Hawley, I. H.
Hedley, W. J.
Heinlen, R. H.
Hendrix, W. P.
Hickok, B. M.
Hillman, A. B.
Hogel, E. C.
Hornig, F. F.
Hoyt, A. C.
Hubbard, M. J.
Huffman, W. H.
Humphreys, R. W.
Hunter, A. L.
Hutcheson, F. W.
Hutcheson, W. A.
Hutto, J. E.
Jackson, T. E.
Jenkins, H. W.
Johnson, A. C.
Johnson, B. O.
Johnson, E. A.
Johnson, H. T.
Kahl, F. B.
Kemmerer, W. G.
Kendal, J. T.
Kieckers, E. W.
Koehler, P. L.
Krefting, A. S.
Kvenberg, S. E.
Leach, A. L.
Linn, G. A.
Little, H. C.
Lokotzke, G. P.
Lord, H. L.
Lowry, J. M.
Lucas, H. F.
Lund, C. V.
Mabry, D. B.
McGrew, F. O.
McKibben, D. H.
Manley, B. F.
Martens, W. F.
Martin, J. W.
Meeks, W. R.
Merrill, B. W.
Messman, D. V.
Meyers, B. R.
Moore, I. A.
Morgan, C. E.
Moris, R. F.
Nichols, J. C.
Oest, W. C.
Ostrom, W. D.
Packard, B. G.
Pahl, W. H., Jr.
Patterson, C. C.
Patterson, J. M.
Pearson, A. H.
Perrier, J. L.
Peterson, N. E.
Pritchard, B. L.
Prude, G. F.
Raessler, V. D.
Rainey, W. H.
Rapier, L. F.
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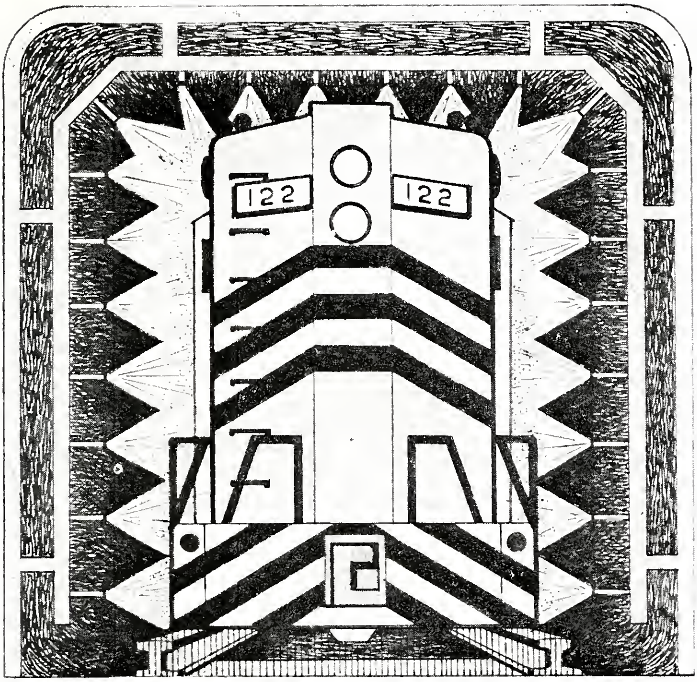

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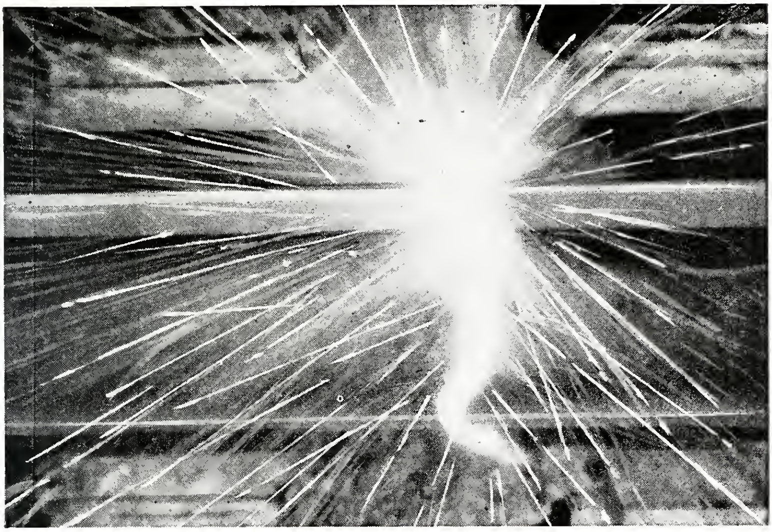

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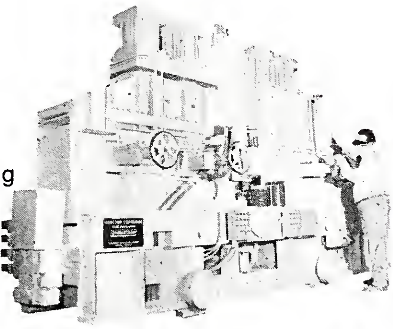

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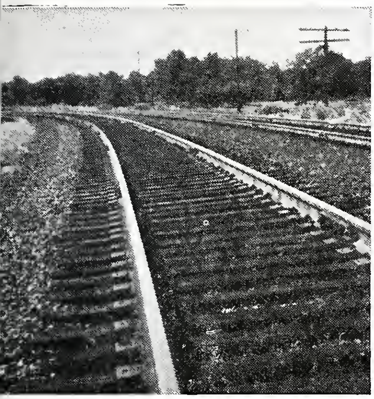

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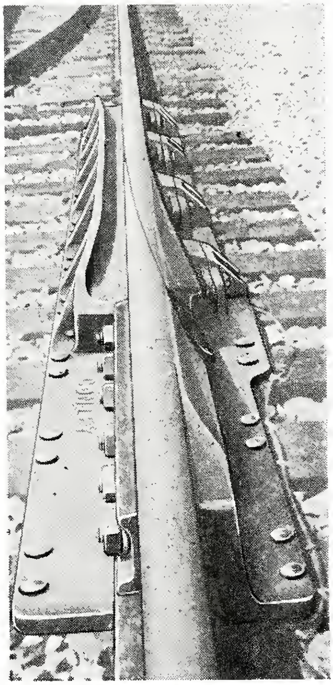

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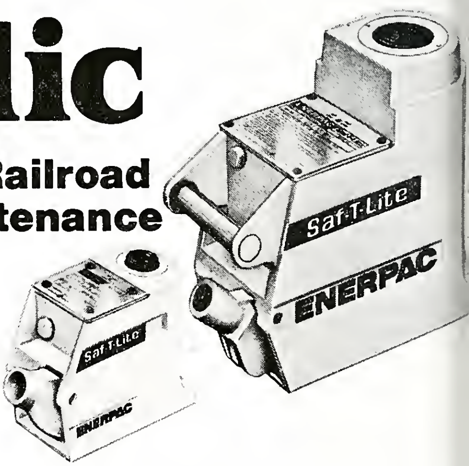

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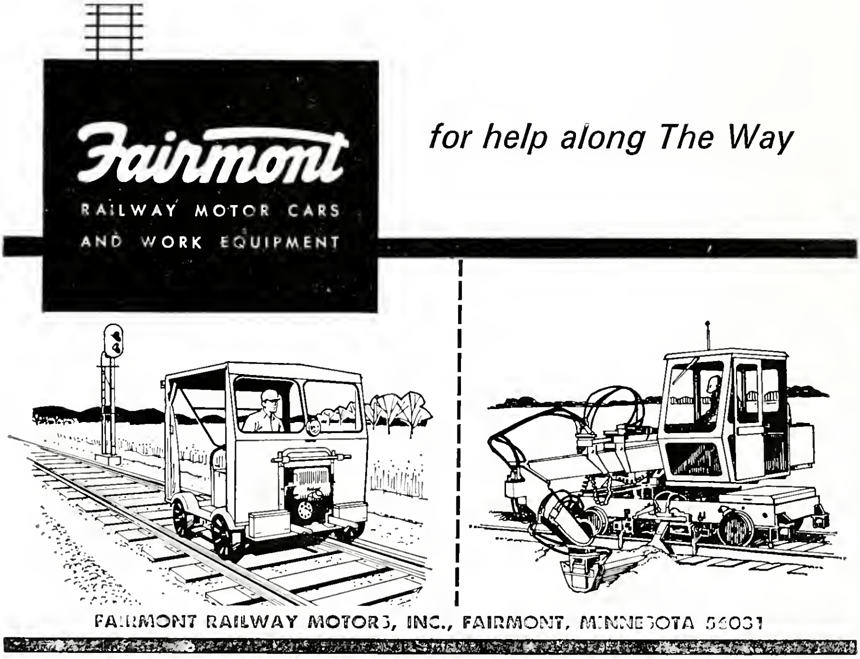
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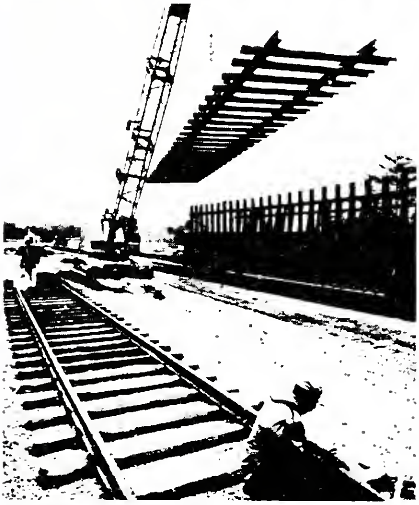

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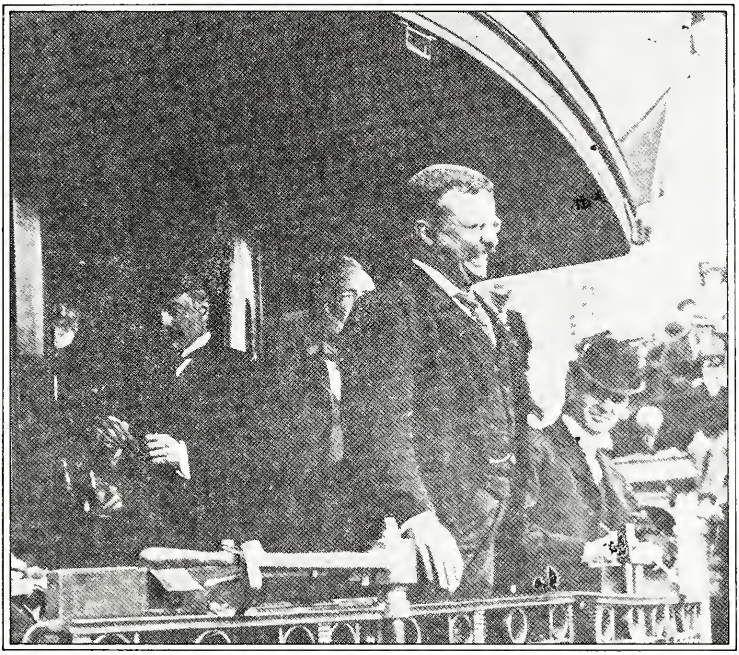

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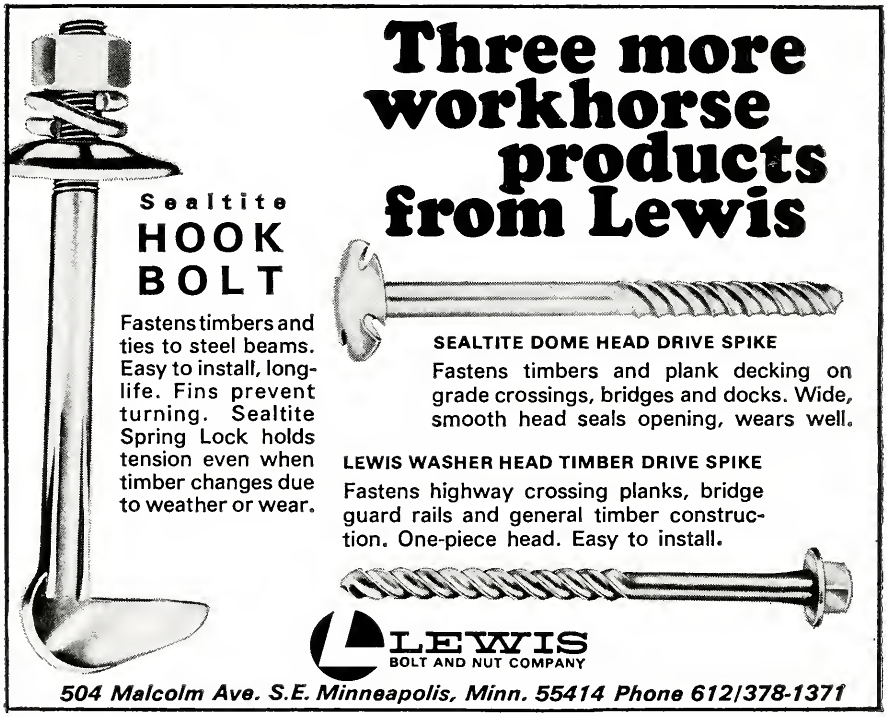
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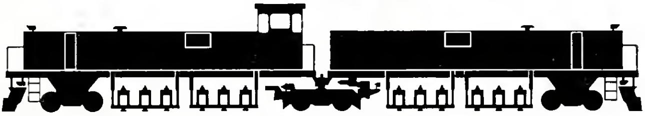

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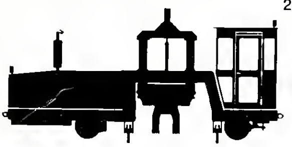

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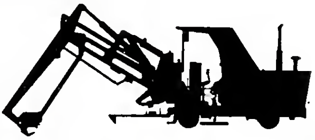

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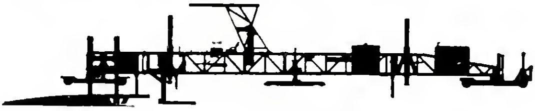

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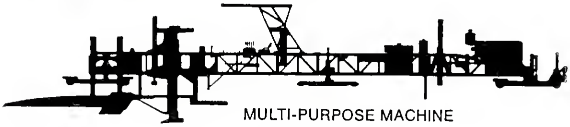

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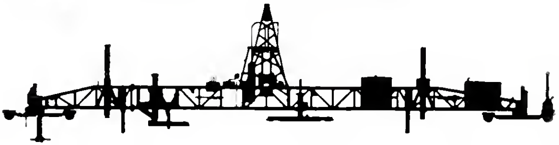

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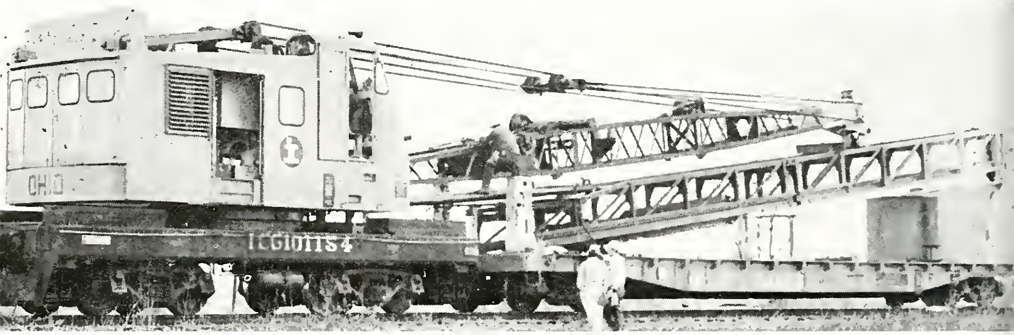

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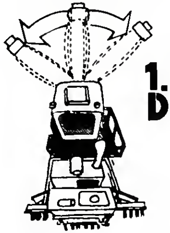

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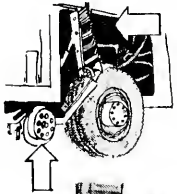

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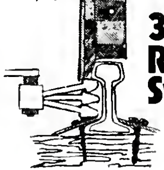

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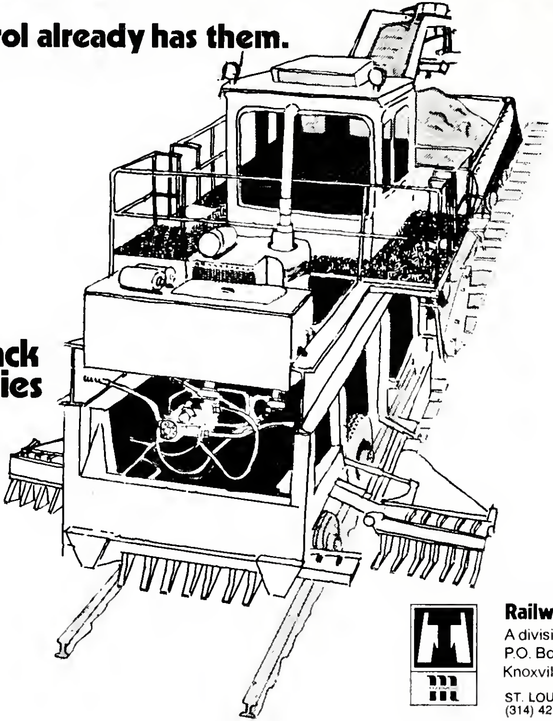

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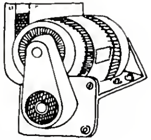

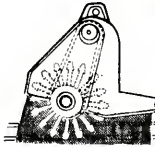

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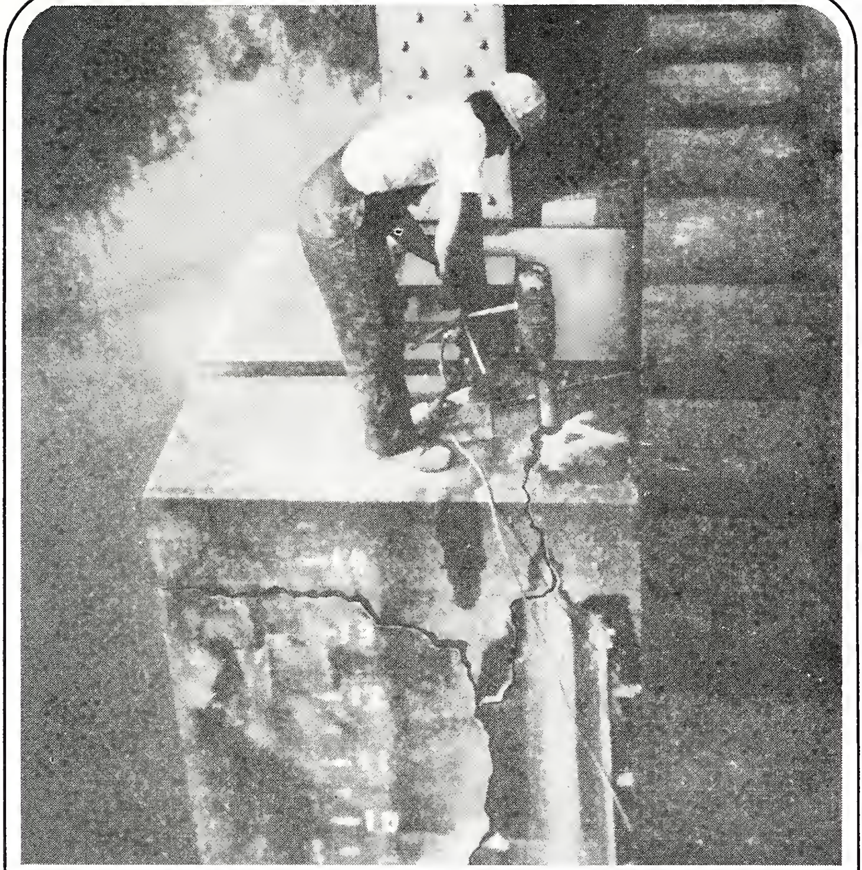

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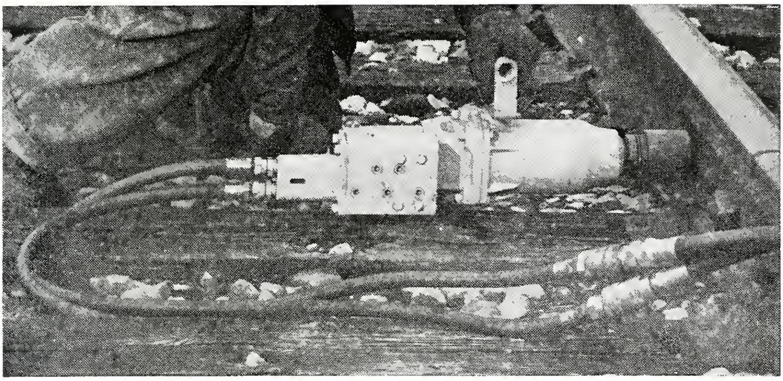

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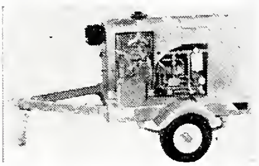

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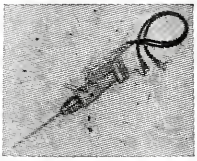

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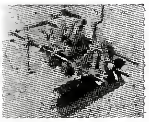

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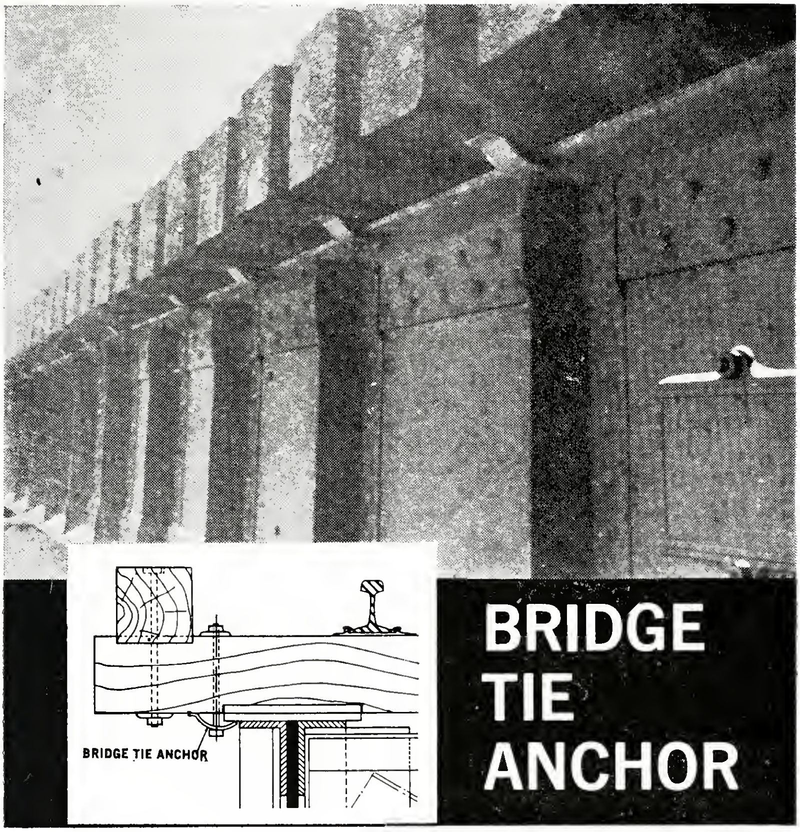

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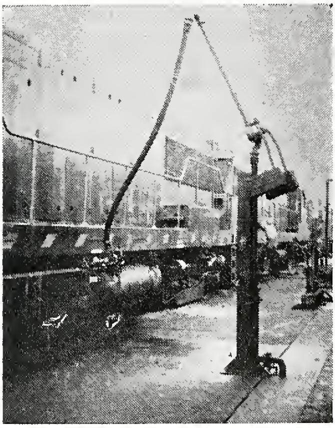

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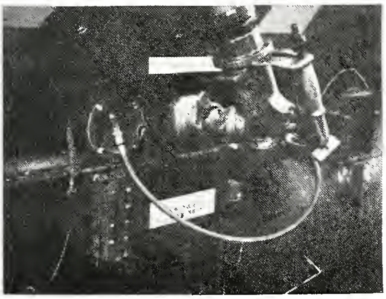
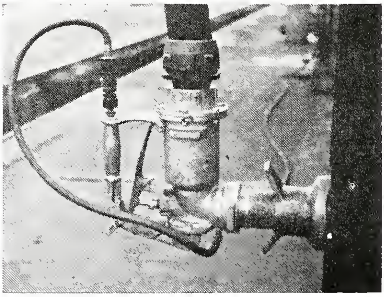


Close-Up of Snyder OPW 1620-DS Automatic Nozzle in operation, with Snyder No. 565 Quarter Turn Fuel Quick Coupling Adapter, connected to Standard Diesel Fuel Tank. Fill Adaptor.



Close-Up of Snyder OPW 1620-DS Automatic Nozzle secured, with Snyder No. 565 Quick Coupling Fuel Adaptor to No. 104-S Fuel Crane.

The automatic diesel fueling installation above increases safety and efficiency in fueling diesel locomotives because spillage of diesel fuel is eliminated, fire hazard minimized, and water is not contaminated by fuel spillage.

Efficiency is doubly increased because unattended fueling is possible with automatic shut-off nozzles. Maintenance costs are reduced because the fueling crane pulls the nozzle and hose up and out of the way, (the nozzle is secured to the fueling crane when not in use) which prevents it from swinging freely and being battered about.

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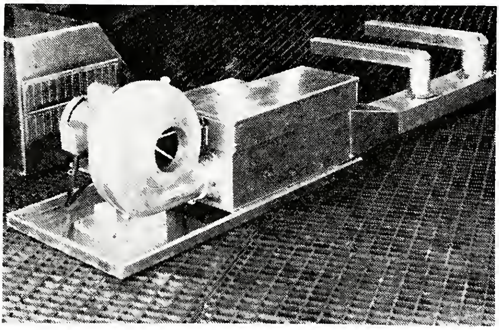

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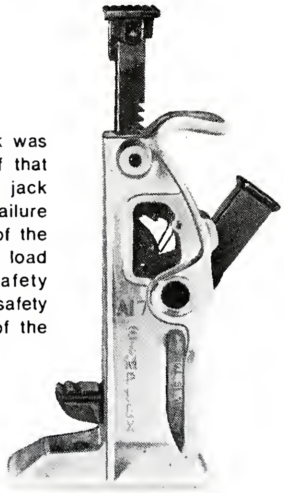

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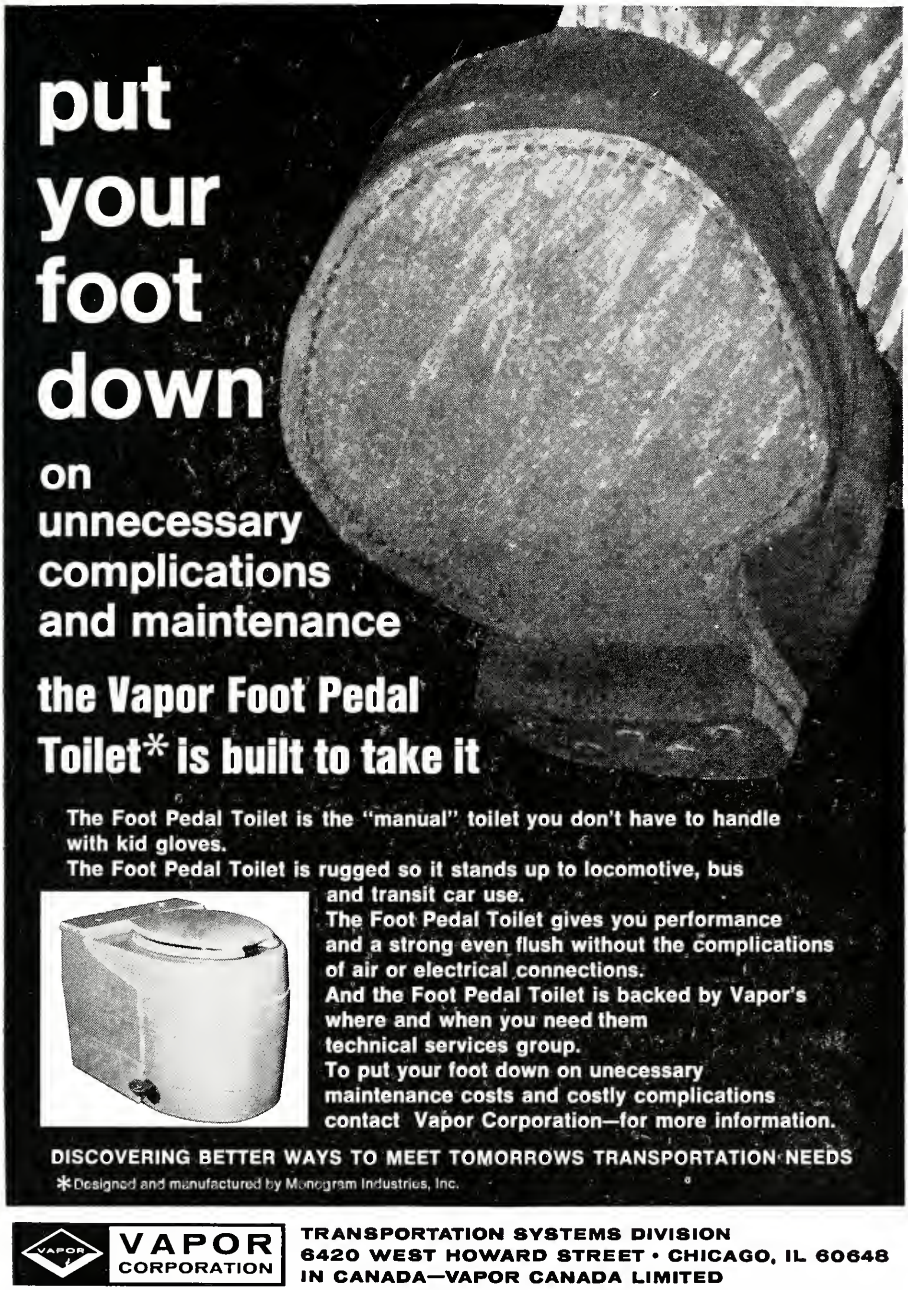

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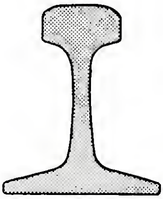

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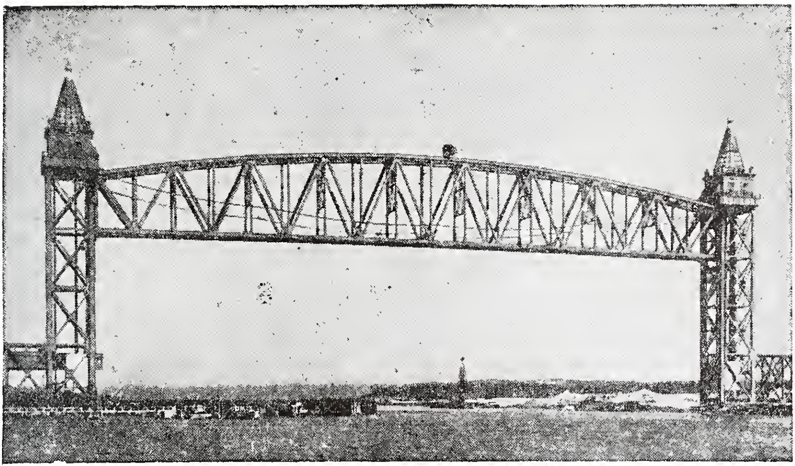

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